COTTON

MARCH, 1911.

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BOSTON JOURNAL OF COMMERCE AND TEXTILE INDUSTRIES and SOUTHERN MILLS.

Vol. 75, No. 5. ATLANTA, GA., MARCH, 1911.

PUBLISHED MONTHLY BY

COTTON PUBLISHING COMPANY

ATLANTA, GEORGIA, U. S. A.

CHICAGO, NEW YORK, BOSTON, TORONTO, CANADA PHILADELPHIA, CLEVELAND, O.

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SUBSCRIPTION RATES.

Domestic ..... Fifty Cents Per Year
Canada ..... $1.00 Per Year
Foreign ..... $2.00 Per Year

Complaints of failure to receive Cotton regularly or of errors of any nature relating to subscriptions should be promptly made to the publication office in Atlanta.

Orders for any change in advertisements must reach Atlanta previous to the 15th of the month preceding month of issue, otherwise publishers cannot be responsible for changes.

Entered at Atlanta Postoffice as Second-class Matter.

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THE SOUTH AS IT IS AND ITS PROSPECTS FOR THE FUTURE.

The Southern Commercial Congress which convenes in Atlanta early this month typifies the commercial and social unity of the South and of the nation. It is their endeavor to induce a proper understanding by the people of the South, regarding the significance of the physical resources of their States, in establishing a greater nation through a greater South; and to sweep out of the minds of the world all elements of misunderstanding regarding the South, its prospects, its people and its opportunities.

The sixteen Southern States which unite in this demonstration have a total approximate area of 970,000 square miles. A coast line of about 3,000 miles. A population of 33,738,000 according to the last census. A coal area estimated by Government experts to be 70,866 square miles. This coal is being mined at a rate of over 100,000,000 tons annually. At the present rate of increase it is estimated that this coal output will be 400,000,000 tons per annum by the end of the next 20 years. So great is this coal supply, however, that even with this enormous estimated output, it will be sufficient to last more than a thousand years.

The available iron ore in these States is estimated at 778,000,000 tons. This, however, does not include a large quantity of low grade ore that may be economically mined some time in the future when more improved methods have been devised. The present annual output of the mines is upwards of 6,500,000 tons. Many other minerals are found in this section in lesser quantities. Probably the most valuable of these is copper and in this connection it is to be noted that in Tennessee is located the largest sulphuric acid plant in the world. This valuable by-product plant was erected to utilize the destructive fumes produced in smelting the copper ore and thus render them harmless to vegetation.

More than 35,000,000 tons of phosphate has so far been mined and the present production is upwards of 2,500,000 tons per annum. The supply of clays for the manufacture of tiles, bricks, etc., is practically inexhaustible. Some of this clay is also suitable for textile purposes. Marbles, granites, limestones and sandstones are abundant and occur in great variety. The income derived from quarrying these stones for building purposes, etc., is around $10,000,000 annually. Over 73,000,000 barrels of cement was produced in 1910 with a value of about $61,000,000. Discovered and partially developed oil land 1560 square miles in area has so far produced 335,549,797 barrels of oil. The present annual production is 27,000,000 barrels.

The estimated undeveloped water power lying entirely within their boundaries is 6,761,500 horsepower. The hydro-electric horsepower developed at present is in round numbers 992,000. There are now in the process of development a number of large plants and it is altogether probable that the year 1912 will see enough of these completed to double the above figures.

The South produces annually 23,500,000,000 feet of lumber, valued at $440,000,000; a grain crop worth $750,000,000; dairy and poultry products to the amount of $345,000,000; rice and tobacco add another $100,000,000; fruit, vegetables, and sugar products, $200,000,000; and live stock, $200,000,000.

Cotton, including seed, had a value of upwards of $1,000,000,000 for 1910. To assist in converting a part of this immense cotton crop, the South employs more than 11,000,000 spindles and 235,000 looms in 850 mills, representing a capital investment of $290,000,000.

These States support 1926 National banks, handling in individual deposits $876,800,000. In addition to this the State, savings and private banks hold deposits aggregating about $950,000,000. The present assessed value of the taxable property of these States approximates $12,716,000,000. The exports from their Atlantic coast and Gulf ports in 1910 totaled $651,446,964, while the railroad trackage necessary to handle this export trade in addition to the inter-state commerce has grown to nearly 72,000 miles. In addition to this is the tonnage carried on their 16,000 miles of inland water ways.

It is impossible to enumerate here all the vast resources of the South, but the outline given will establish the significance of this Commercial Congress and the vast interests they represent. One of our great financiers in the Southland has said, "It seems a great pity that England, Germany and other European countries, which do not grow a boll of cotton, should weave into fabric this staple, and they so far removed from raw material." He also makes the prophecy that the time will come when the South will utilize her entire crop of cotton in her own mills. Why should this not be the ultimate end? Why should not the South manufacture entirely this huge billion dollar crop of cotton?

Would it not be a fitting conclusion to the giant steps already taken along these progressive manufacturing lines? The last thirty years have seen an increase of over a thousand per cent. in the cotton used for manufacturing purposes in the Southern States. Every year sees new mills constructed and old mills better equipped. The hot pace being set by these mills in the line of economical production is being felt in every manufacturing center of the world.

With a continuation of these progressive methods; with many of the larger manufacturers turning toward the finer counts of yarn; with properly governed immigration bureaus to secure and select the increased number of experienced operatives that will be necessary; with the trade of the Latin-American countries, which our merchants are bound to get if they live up to their reputation for American hustle, to be supplied; and with the shorter sailing route, via the Panama Canal to the markets of Equador, Peru, Chili, New Zealand, Australia, and the Orient; who shall say that this dream of the future may not be a true forecast? What may not another score of years bring to this rich section that is ruled by King Cotton?

The fertile South for many years felt the effects of the heavy hand of adversity, but these States are now rapidly and surely forging ahead, not, as one writer says, "to that proud and independent position occupied by them fifty years ago," but to a new and far greater position than they have ever occupied in the industrial and financial life of the country and of the world. They are now riding on the swell of a great tidal wave of prosperity, whose motive force is based upon the sound and proper development of their marvelous natural, agricultural and mineral resources. The farmers, the manufacturers, the bankers, the merchants, the railroads and every inhabitant of these States are all working to forward this development, although up to the present they have failed to act entirely in unison. The very fact that they have thus failed only serves to show the great potentiality of their power when they do align themselves into one body. The "individual play" thus far has shown spectacular returns, but as this Commercial Congress shows, the signal has been given and they are getting in formation for a "mass play" that can have but one result—unqualified and undreamed of industrial prosperity for the Southern States and through these States, the nation.

SPECIAL AGENTS TO STUDY FOREIGN MARKETS.

The announcement of Secretary Nagel of the Department of Commerce and Labor, of the appointment of R. M. Odell, of Concord, N. C., and J. M. Hause, of Greensboro, N. C., as special agents to study the foreign markets for cotton textiles, was not entirely unexpected. With two agents in the field the work of finding and extending markets for American goods will receive an added and much needed stimulant. This improvement was directly accomplished by Congressman Webb, who had the amount to be expended for these investigations increased from $40,000 to $60,000, when the agricultural appropriation bill was before the house a short time ago.

R. M. Odell is the son of W. R. Odell of Concord, and the grandson of the late Captain J. M. Odell, who was one of the factors in the industrial development of that section of North Carolina in which he lived and where he became one of the pioneers of the textile industry of the State.

Mr. Odell is an honor graduate of Trinity College of the class of 1903 and received his bachelor of arts degree from Harvard University in 1904. He completed a course in the Armour School of Technology, Chicago, and then began work in a cotton mill. After making himself thoroughly familiar with the manufacture of textiles, he accepted the position as superintendent of the Odell Mfg. Co., and later became general manager of these mills. For the past several years he has been secretary and treasurer of the Magnolia Mills Co., of Concord, N. C. Mr. Odell states that it is his very earnest desire to secure the hearty co-operation of the cotton manufacturers in this country in the work which he proposes to undertake and he would be pleased to have as many of them as possible, communicate with him before he leaves for foreign countries, and also have them offer any suggestions which to them may seem proper. After March 1st, he may be addressed in care of the Bureau of Manufactures, Washington, D. C.

The Greensboro friends of Mr. Hause were much pleased to learn of his appointment as a special agent. He has been engaged in the cotton business for sometime and is a very popular man in his community. He has been located in Greensboro about three years and has made many friends. Both these men carry with them to their new positions the best wishes of their many friends for ultimate success.

THE SOUTHERN COMMERCIAL CONGRESS

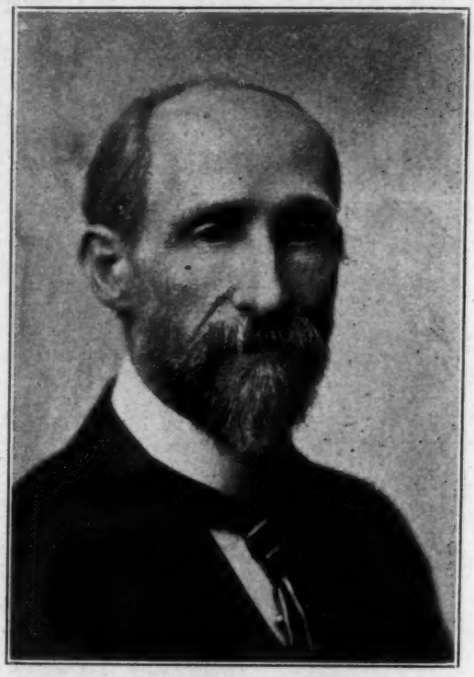
A Brief Review of the Third Annual Convention—Prominent Men Speak on the Wonderful Commercial and Industrial Progress of the South

This convention, whatever else it did or may do, typified the present industrial solidarity of all the States into one great nation. While only the sixteen Southern States were formally represented, men from every State in the Union were present and taking a more or less active part in the demonstration.

WELCOME AND GENERAL STATEMENT.

The program began Wednesday morning, March 8th at the auditorium, when the Right Rev. C. K. Nelson, Bishop of Atlanta, offered the invocation.

John M. Parker, of New Orleans, La., the President of the Southern Commercial Congress, delivered the opening statement. He said: "Fifty years ago a meeting of this

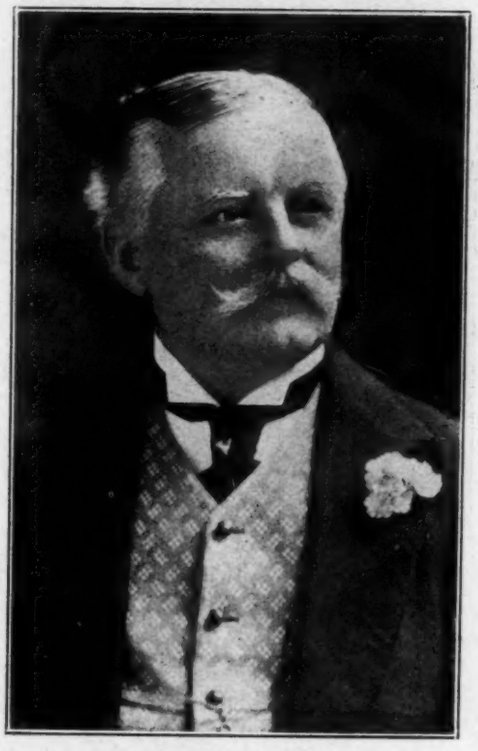


GOVERNOR JOSEPH M. BROWN.

character would have been beyond the conception of the wildest dreamer, and the greatness of the United States is typified when the great men of the nation now assist in making the world appreciate the vastness of Southern possibilities. * * * * Horace Greely's advice, were that great man alive today, would be, 'Go South, young man,' for there lies today the greatest possible field of development for the young man of brain and brawn.

"With the advent of that army of young men we shall see a radical change and a marked transformation come over this entire Southland, and the young man of power and of ability will have no trouble in finding and stepping into his own and assuming that leadership to which his abilities entitle him. This is truly the day of the young man, and the sooner we learn and appreciate the fact, the better off we shall all be.

"Organized as it was by the commercial secretaries throughout the South, the Southern Commercial Congress has been largely an organization of young men, imbued with the determination of making of our section God's Garden Spot, where character, integrity and ability stand ahead of all other requirements. Since its beginning the Southern Commercial Congress has earnestly worked to intelligently spread broadcast truthful information in regard to the South and her possibilities. That work has not been in vain as is eloquently attested by the able thoughtful men who have attended this convention to assist, not only in creating 'A greater Nation through a greater South,' but



GENERAL JULIAN S. CARR.

whose hearty support in assisting to overcome those obstacles which confront our people is bound to make us 'The greatest Nation through perfect unity.'"

The address of welcome was delivered by Gov. Joseph M. Brown, of Georgia, who briefly discussed the history and resources of that State and closed by extending Georgia's warm welcome to the convention.

The response by General Julian S. Carr, of Durham, N. C., second vice-president of the Congress, was so completely appropriate to the occasion, that to reproduce only a part would be so manifestly inadequate as to spoil the effect of the whole. General Carr, as the authorized mouthpiece of the sixteen States represented, gave to his hearers a verbal miniature of each one of these States, while mak-

ing graceful acknowledgement in their behalf for the invitation to partake of Atlanta's hospitality.

The next speaker was Edwin L. Quarles, secretary of the Southern Commercial Congress, whose subject was the General Statement of the History and Purposes of the Congress. He told briefly of the meeting at Chattanooga in 1908, of the representatives of Chambers of Commerce and other kindred organizations from the different Southern cities and described the presentation at that meeting by G. Grosvenor Dawe, then secretary of the Commercial Club of Montgomery, Ala., of the germ thought from which grew the Southern Commercial Congress.

This thought, simply stated, is that the South is a section of country, affected more or less generally by two primary conditions, the first being an internal lack of appreciation of Southern possibilities and a consequent lack

EDWIN L. QUARLES.

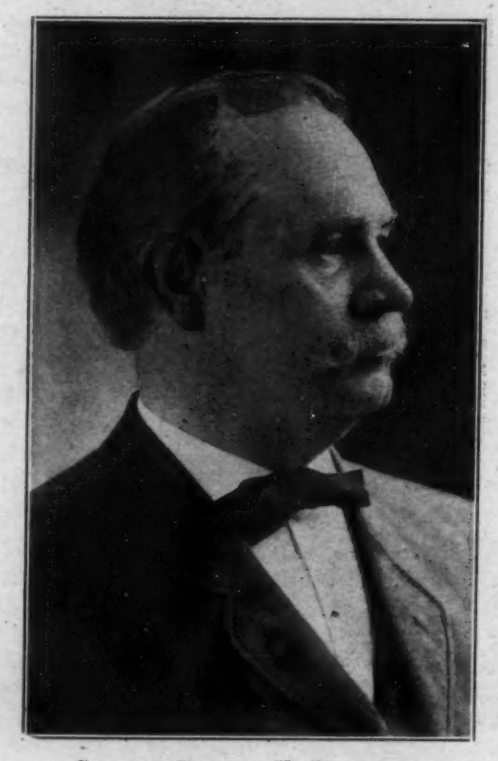
of organized effort for promotion; and the second being an external lack of knowledge as to the truth of Southern conditions and opportunities, this approaching almost a prejudice against the South as a region in which to invest and to live.

"While this magnificent assemblage of men meeting in Atlanta today will attract the eyes of the world to the activities of the South," said Mr. Quarles, "still the management of the Congress is particularly anxious that no man fail to appreciate that it is simply the annual convention of an organization which, from day to day, is straining every effort to accomplish the primary purposes set forth in its Constitution."

This organization he described as, "a centralized agency for creating self-knowledge and greater activity toward progress within the South and for assembling and distributing to the nation and to the world the broad facts regarding the South which show it to be the greatest land of opportunity upon the face of the earth."

"Southern Patriotism in Business Endeavor" was the subject of the address by Asa G. Candler, of Atlanta, Ga., who said in part: "The supreme obligation of Southern patriotism in business endeavor is the duty of improving our best asset—the Southern people. The richest resource we have is our youth. Other sections have gone far ahead of us in the matter of providing adequate educational instrumentalities for the best development of their human resources. We have urged as an excuse the hard conditions with which we have struggled since the close of the Civil War, but much of its former force is gone. Our financial and industrial conditions have greatly improved and they are no longer such as to forbid our doing what is needed for the equipment and endowment of the schools and colleges of the South. And let us be well assured that the development of our material resources cannot advance more rapidly than the mental progress of our people.

"With all our resources rightly developed there is before the South the most glorious mission and the brightest future. Her part in the international commerce of the Pacific must be very great in view of the nature of her product and her geographic position with reference to the Isthmian Canal. The homogeneity of her population imparts a solidarity to all her movements which must greatly increase their momentum. Her latitude and climate are the most favorable for the highest achievements in every line of worthy endeavor. With such natural advantages, the Southern States of America, in the golden age of peace and plenty now beginning to dawn upon the world, may fulfill as great a mission as the Southlands of the old world fulfilled in the centuries of the historic past."



SENATOR DUNCAN U. FLETCHER.

Senator Duncan U. Fletcher, of Florida, who is also a member of the executive committee for the Southern Commercial Congress, treated his subject, "The Southern Renaissance" very thoroughly. He reviewed the historical associations of the South from the time of the first slave trading voyage in 1564 down through to the war of the revolution; through the early years of the young republic; through the stirring years from 1835 to 1865; and through

the dark days of the reconstruction which followed the devastation of those earlier years.

Senator Fletcher said, in part: "The definition of the word "renaissance" allows a broad generalization, to-wit: A new birth, or revival and in this wider scope we may find quite proximate applications to Southern conditions. In the short time since the very form of their society was subverted by the ruthless hand of war, since the very genius of their life was destroyed, the South has, along all lines of development, set the example of the world. The Southern people have shown a self reliance, courage and energy unsurpassed in any land, and in the little while since bayonets were removed from their poling places and legislative halls, the results are indicated in an industrial and commercial growth that has no parallel.

"We come today to emphasize this unfolding which has been going on, to point the way, if we can, to speedier and more complete results; at least, to encourage effort, to strengthen attachment, to enlist additional interest, to broaden the horizon, to quicken any lagging spirit, to extend the fields of endeavor, to reach out for influences that are ready to join forces with you and to 'speak unto this people that they go forward.' The renaissance of Europe marks the recovery from stupor and darkness. The renaissance of the South marks the recovery from defeat and devastation!

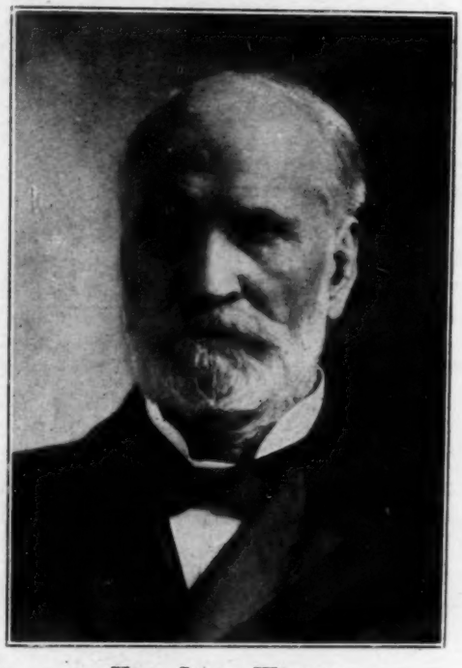
"The lessons of the past constitute a priceless heritage, but we are not living on our inheritance. Everything that has gone before enters into the making of the present. We reach back to the shadows and forward to the rich substance ahead. Across all barriers to the limits of the republic, in all directions, the influence of this transition which has come over the majestic domain of the South extends—in gratification and admiration. Back comes the greeting from every quarter, which thrills the new energies to further endeavor in recognition of the unity and common destiny. No physical separation is possible, likewise no commercial, industrial, or intellectual separation. Every State and Territory unite to make the nation. A benefit to any portion rebounds to all. The progress of the portion called the South is therefore nation-wide in consequence.

"It cannot be justly said, that the South is exclusively agricultural, although more people are there engaged in agriculture, than in all other occupations combined. The task then of augmenting that earning power, making possible the building up of the farmer's efficiency, is the supreme one before the South. But in the years that have elapsed since the war, the enlightened mind of the South has come to realize that equally as notable as its possession of rainfall and growing hours is its possession of coast line, great navigable rivers, water powers, forests, and minerals in extraordinary variety and in generous extent. This leads us again into saying that the South is needed by the nation; that its strength must be in her sinews; that its blood must be her blood; that its heart of purpose and of success must be her heart of purpose and of success. As the men of 1776 gave to the world a new nation, the men of today are giving to the world a new South, which contributes to the greatness of that nation.

"The heart burnings, the tragedies, the bitterness of the past are no more. The South has awakened. In her might she has arisen. Men of the South have responded. New conditions have been met. Belief in themselves have gained the sympathy and support of the whole country. Confidence in their advantages and possibilities has begotten the faith of all who are informed. The marvelous resources all about you are beginning to impress you, and through you, Christendom. Men of the South, you are winning! A new era is dawning for this goodly region, and the crowning glory of it all is that as you prosper and grow, it means the enrichment of the nation."

EXTERNAL VIEWS OF THE SOUTH.

This section of the program was opened Wednesday afternoon at 2:30 o'clock by the Hon. James Wilson, Secretary Department of Agriculture, who spoke on "The Agricultural Obligation of the South." He urged the



HON. JAMES WILSON.

South to keep her money at home and raise her own food supplies. Mr. Wilson treated briefly on the different varieties of crops and urged the substitution of quick-fruiting, short season, weevil resisting varieties of cotton, for the late maturing varieties; the substitution of the early, big boll, storm-proof kinds for the old small boll varieties that require more labor in picking; and the use of varieties with long, strong and uniform fiber. He also outlined what the Government has done and is doing to further the interests of the farmer.

In speaking on "Modern Industrialism," George W. Perkins, of New York, referred to the progress of the past century along scientific lines, and compared the business methods of 1810 with those of today. He called attention to the relatively rapid advances in business methods, brought about through the medium of this advance in science and explained how improved inter-communication has naturally led to the formation of large corporations.

Continuing, Mr. Perkins said: "A corporation is a composite of steam, electricity and men. We have learned how to regulate and control steam and electricity. Let us teach ourselves how to regulate and control a corporation. The American public is not afraid to use steam, nor dyna-

mite, nor even chained lightning; but we are afraid of a dishonest, corrupt, unfair and supremely selfish man.

"The day has come when we need statesmanship in business. I have long believed that we should have at Washington a Business Court to which our great business problems could go for final adjustment when they could not be settled otherwise and on which no man could sit who had not a business training, with an honorable record. And in connection with the relations of business to the Government, I believe that publicity, full and frank, will go a very long way toward correcting any evils that exist and preventing any that may threaten.

"With inter-communication so complete, there is no longer any South, North, East, and West. We are one mighty unit, welded together with bands of steel and streams of electricity. What effects one, effects all. The real question, at base, is not commercial, financial or governmental,—but moral; a question of what is right and fair as between man and man—a very, very old question made new, acute and burning as never before, because we all have been drawn so closely together that the improper act of one man injures a larger number of men than ever before.

"The need of the hour is for men of Southern honor and Northern strength; of Eastern conservatism and Western optimism. We need Southern chivalry not only between man and woman, but between man and man. Our past is secure. Our present is a vast, unprecedented opportunity. Our future—whatever we Twentieth Century men of the South, North, East and West, working mind and mind together, decide to make it."

Arthur Kavanagh, cashier National City Bank, New York, covered his subject "Opportunities in Southern Finance" in a very thorough and concise manner and urged the establishment of banks to do foreign business, because that would materially assist the South in the marketing of her constantly growing volume of manufactures.

THE SOLID SOUTH OF BUSINESS.

This section of the program took place in the evening, beginning at 8 o'clock, when the following distinguished business men from the different States responded, each being introduced by the Governor of his State:

Albert P. Bush, president Chamber of Commerce, Mobile, Ala.; S. W. Fordyce, publicist and capitalist, Hot Springs, Ark.; F. P. Conroy, president Board of Trade, Jacksonville, Fla.; J. S. Davis, secretary Chamber of Commerce, Albany, Ga.; Logan C. Murray, president American National Bank, Louisville, Ky.; B. Howell Griswold, Jr., of Alexander Brown and Sons, Bankers, Baltimore, Md.; B. W. Griffith, president First National Bank, Vicksburg, Miss.; C. P. Walbridge, president J. E. Merrell Drug Co., St. Louis, Mo.; J. Elwood Cox, president Commercial National Bank, High Point, N. C.; Henry Exall, Dallas, Texas; and W. H. Saunders, president W. W. & G. R. R. Co., Washington, D. C.

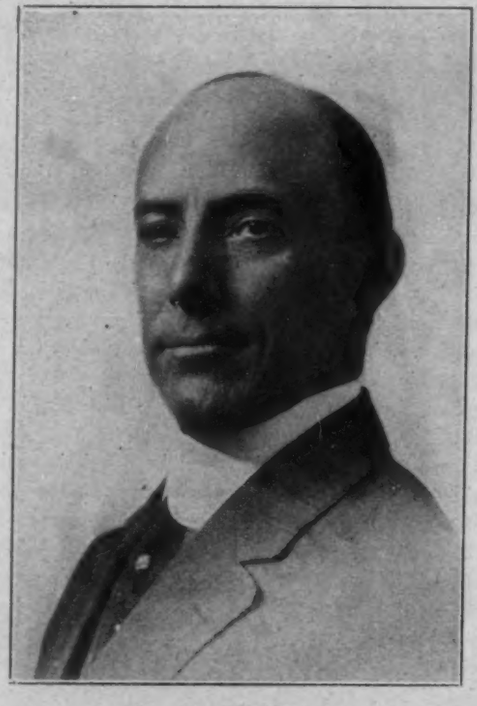
Because of the lateness of the hour, the addresses in behalf of other States were postponed until the morning session on Thursday.

At the opening of the morning session Thursday, March 9th, the delegates of the States left over from Wednesday night continued in response to their subject, "The Solid South of Business." Those sepaking were Mayor Bell, of New Orleans, La.; Charles N. Gould, Norman, Okla.; E. W. Robertson, Columbia, S. C.; Leland Hume, Nashville, Tenn.; Walter Sharpe, Norfolk, Va.; and Oliver G. Beans, of Wheeling, W. Va.

Another important speaker continued from Wednesday's program was Arthur M. Harris, of Harris, Forbes & Co., New York, who spoke on the "Field for Southern Bonds." Mr. Harris treated in detail the early financial history of the South, and continued in part as follows: "Investment bond houses and careful investors, expect a State which issues bonds or allows a municipality or county to issue bonds, to protect the bond holders in every legal way. The greatest difficulty we encounter in the South and one of the foremost reasons for the prejudice among investors against Southern municipal bonds is the matter of tax limitations. By this I mean a restriction placed upon the taxing power of a municipality or county, either by the constitution of the State or through legislative action.

"The objection to such a tax limitation is that during a period of business depression, especially if the depression is a protracted one, the assessed valuations of property may fall to such an extent that the municipality or county cannot raise revenues sufficient to meet this obligation. The result is a default in the interest payment and the credit of the issuing body is seriously effected for years.

"The same result can be accomplished by better means.



ARTHUR M. HARRIS.

A very large measure of protection can be given by limiting the amount of debt that could be incurred, usually in relation to the assessed valuation. I would strongly recommend that each of your Southern states which has a tax limitation immediately take up for serious consideration the enactment of laws repealing this limitation and a substitution of laws limiting the percentage of debt. We ask your co-operation in the legislature and otherwise that we may be able not only to say to our friends, these securities from the Southland are good, but they are among the best.

"With millions of acres of fertile land awaiting the

plow, with billions of tons of coal, iron ore, phosphate rock, sulphur and other minerals to be taken from the earth, and with its teeming opportunities for enterprises and energy, the South invites to investment, the mind, the muscle, and the money of the world."

THE WORLD AS A MARKET FOR THE SOUTH.

"The Obligations of the Panama Canal" was the subject of the first address on the regular morning program. Bernard N. Baker, president of the Baltimore Shipping League, covered this subject concisely and strongly urged all commercial bodies, every business man, merchant, farmer and manufacturer to "do something" and to urge their representatives in Congress to "do something, to place ourselves and our nation in a position to take advantage of this great waterway—the Panama Canal." He emphasized the need of the development of the export business from the Southern ports to South America, and the Orient.

Dr. J. C. Calhoun Newton, of Japan, discussed the South's new approach to the Orient by the way of the Panama Canal and vehemently asked, "What is the canal worth to the United States without ships, and how can shipbuilders and owners in this country hope to successfully compete with those of European countries unless they are given the same assistance that these competitors receive from their governments?"

The next address was delivered by John Barrett, Director-General of the Pan-American Union. In speaking of the South's obligation in South America, Mr. Barrett em-

HON. JOHN BARRETT.

phasized the fact that the motto and slogan of the South for the next three years should be, "Get ready for the Panama Canal." Continuing, he said, "If you ask me what I mean when I say get ready for the Canal, I will reply with the questions: What have your city, your commercial organizations, your manufacturing, exporting and importing firms actually done to get ready for the canal? Have they studied intimately and comparatively the vast and virgin field of trade exchange which will be suddenly opened to them by a direct sea route when the canal is completed? Have they investigated the essential laws and conditions of supply and demand? Have they found out what the people want to buy and sell? Have they familiarized themselves with the competition of European and even Asiatic merchants? Have they looked into the climatic, physical, material, and industrial characteristics of these numerous resourceful lands bordering on the broad Pacific and about to enter upon a marvelous new era of progress and posperity. With full respect for the other questions to come before this gathering, it is no exaggeration or assumption to insist that the greatest opportunity and responsibility now before the South is that of getting ready for the Canal."

Charles H. Sherrill, United States minister to Argentine, followed Mr. Barrett with a strong plea for co-operation and organization in the commercial conquest of South America, particularly in manufactured textiles.

In the afternoon there was a social event at the Piedmont Driving Club in the form of a luncheon to Colonel Roosevelt, and a reception given by the Atlanta Chamber of Commerce in honor of the visiting Governors and the Southern Commercial Congress.

The first speaker of the evening session was Atherton Brownell, president of the Century Syndicate, of New York, and American Director of the Brazilian Commission of Economic Expansion, on the subject of "Co-operation in Publicity." He was followed by Col. L. D. Tyson, of Knoxville, Tenn., who spoke on the "Textile Opportunities of the South." Owing to lack of space a complete review of Mr. Tyson's address will be included in the April issue.

"The Promotive Power of the Southern Press" was the subject that gave John Temple Graves, one of the editors of the New York American and a former editor of the Atlanta Georgian, the opportunity to deliver a brilliant and witty address on what the Southern papers have done and are doing for the South. He enumerated a number of prominent newspapers and editors who had in the past made history in the Southland and also some of those who are at present also making history.

The address which undoubtedly attracted the most attention of any on the evening program was that of Col. Theodore Roosevelt on "The South's Obligation in Statesmanship and Business Endeavor." Colonel Roosevelt addressed a crowd so large that the officers of the fire and police department were obliged to order the doors closed and no further admission was permitted. It was estimated that there were something over 7,000 people in the great hall to listen to our famous Ex-President. Colonel Roosevelt paid his respects to the previous speakers by a few witty remarks and then urged his Southern auditors to "strive for commercial success and industrial prosperity, but to always retain, and retain closely, the principles they had inherited from their forebears." "We must have progress," he said "or else there will be stagnation. Always remember, however, that material prosperity without character is worse than a misfortune. We are realizing more and more throughout this land," continued the speaker, "that speaking largely, what benefits one part of us, benefits all of us, but in the end we must go up or down together. I want to see you people of the new South go forward and prosper, but never lose the idealism of the

old South." He urged honesty and civic righteousness and a square deal on the part of the people and also on the part of the corporations. "If justice is not done to the corporation, the result will be fatal," he said, but he insisted that while giving the corporations real justice, at the same time they should be carefully regulated and looked after to see that they also gave the public justice.

COLONEL THEODORE ROOSEVELT.

The speaker said that he had learned from experience that to split the large corporations up into smaller corporations, was not what was required to control them as by the means of gentlemen's agreements or other understanding between the small corporations, the same difficulties were encountered after they, the large corporations, had been dissolved into smaller ones. He urged federal legislation that would regulate, but regulate thoroughly and honestly. He expressed the opinion that the attention of the different governments of Europe and of the world was centered upon the United States watching to determine whether the form of government of the American republic was to be a success or a failure. Many others who have tried this form of government have failed, but the speaker expressed the belief that this republic would not fail. "Be on your guard against demagogy and ignorance," he said, "as much as against greed and dishonesty. This government must never become a government by a mob, or a government by a plutocracy. If it becomes either it is doomed and it will deserve its doom. We bear upon our shoulders a great work and a great responsibility. If this republic fails, with it fails the hopes of the nations of mankind."

THE SOUTH'S NEW UNION.

On Friday morning, March 10th, almost fifty years to a day after the booming cannons in Charleston harbor gave the trumpet signal for the opening of the Civil War, President William Howard Taft, chief executive of the United States, holding in his hand a gavel that symbolized the reunited South and officiating as Chairman of the Southern Commercial Congress, sounded the peaceful signal that marked a new epoch in the history of the Nation.

At the tap of the President's gavel, a band in one end of the vast auditorium amphitheater struck up the stirring tune of "Dixie." To this tune, separate groups of men from each of the sixteen Southern states, headed by gray-haired veterans bearing aloft the flag of the sovereign State they represented and under whose folds they had fought so bravely fifty years before, marched down the center aisle to the rostrum cheered to the echo by the 5,000 spectators in the galleries.

After passing in review before the President, the sixteen State flags were arranged in a semi-circle at the back of the stage. Hardly had the strains of "Dixie" ceased to echo through the hall, when with a resounding fanfare of trumpets the opening notes of the "Star Spangled Banner" were heard and simultaneously there floated down

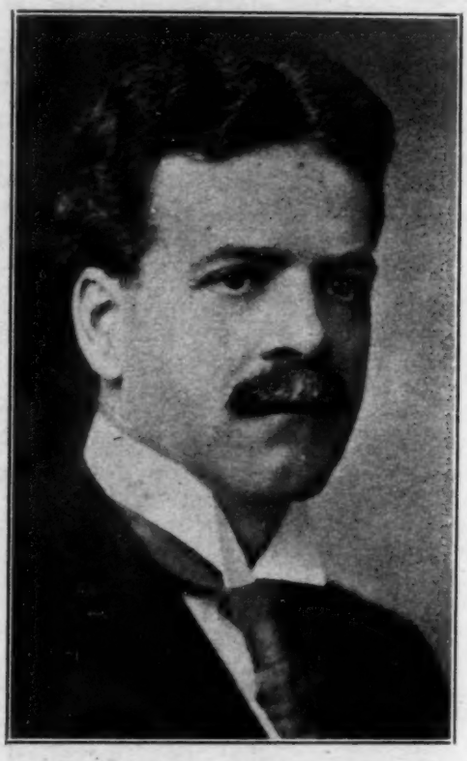
PRESIDENT TAFT.

from the rafters a gigantic specimen of the "stars and stripes," the glorious emblem of this whole free and reunited nation, sweeping with its edge the smaller emblems grouped beneath, while above all there appeared in scarlet letters on a field of white the legend of the nation, *"E Pluribus Unum."*

President Taft then introduced as the first speaker former Senator James Gordon, of Mississippi, who delivered an oration on the old South. He was followed by Dr. Clarence J. Owens, commander-in-chief of the United

Sons of Confederate Veterans, who delivered a stirring oration on the new South.

Hardly had Dr. Owens concluded, when President Taft began calling for contributions from the various States represented to assist in furthering the work of the Con-



JOHN H. FINNEY.

gress and in about ten minutes time he received pledges for $27,000.

In the afternoon there were various social events in honor of the distinguished visitors.

Thirteen section meetings were held in the afternoon as indicated in the following program. The addresses delivered at these meetings will be printed later in book form by the Southern Commercial Congress for distribution among interested parties.

The program and speakers were as follows:

AGRICULTURE.

Held in the Senate Chamber of the Capitol. The subjects treated were "Agriculture," Chairman Victor H. Olmsted, statistician and chief of the Bureau of Statistics of the United States Department of Agriculture; "The South's Rainfall and Temperature as Explaining Southern Agricultural Monopolies," Dr. W. A. Withers, West Raleigh, N. C., Department of Chemistry, North Carolina College of Agriculture; "Diversification in Southern Agriculture," J. A. Evans, Shreveport, La., farm demonstration work; "The Agricultural Life of the Nation Depends Upon the Conservation of the Soil," Henry Exall, Dallas, Tex.

COMMERCE.

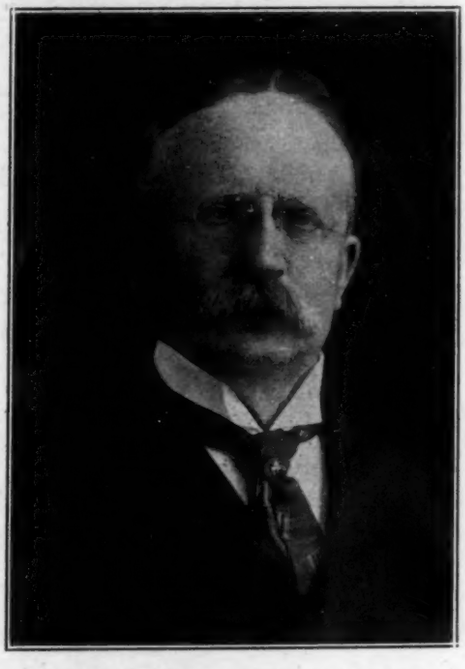
Held in the Boys' High School Hall. The subjects treated were "Commerce," Bernard N. Baker, Baltimore, Md., president Shipping League of Baltimore; "South Atlantic Ports, Their Conditions and Prospects," J. F. Gray, Savannah, Ga., vice-president Chamber of Commerce; "Gulf Ports, Their Conditions and Prospects," O. Owen, Port Arthur, Texas, secretary Board of Trade; "Railroads, Southern Ports, and Freight Routes," R. L. McKellar, Louisville, Ky., assistant traffic manager Southern Railroad; "Railroad Prospects in the South," L. E. Johnson, Roanoke, Va., president Norfolk & Western Railroad; and Charles H. Sherrill, U. S. Minister to Argentine, also made a strong plea for a larger American Merchant Marine.

COMMERCIAL ORGANIZATIONS.

Held in the Boys' High School, Room 23. The subjects were "Commercial Organizations," Chairman Adolph Boldt, Houston, Texas, secretary Chamber of Commerce; "The Commercial Organization Movement of the South," G. A. Waterman, Pensacola, Fla., secretary Commercial Association; "Co-operation Between Southern Commercial Organizations," Bruce Kennedy, Montgomery, Ala., general secretary Business Men's League; "The Oklahoma and Southwestern Plan of Organization," H. G. Spaulding, Fort Smith, Ark., manager Commercial League, Inc. Other speakers were Charles H. Sherrill, Minister to Argentine; C. C. Kirkpatrick, Chickasa, Okla.; R. B. Naylor, Wheeling, W. Va.; and Alexander Fitzhugh, Vicksburg, Miss.

EDUCATION.

Held in the Georgia Tech Drawing Room. The subjects were "Education," Chairman, Commissioner E. E. Brown, Bureau of Education, Department of the Interior; "Technical and Industrial Education for the South," Carleton B. Gibson, Richester, N. Y., president Mechanics Institute; "Education of Constructive Leadership, State and National," Dr. S. C. Mitchell, Columbia, S. C., president University of South Carolina; "Taxes as Related to Education," Hon. T. H. Harris, Baton Rouge, La., State Superintendent of Public Instruction.



SURGEON GENERAL WALTER WYMAN.

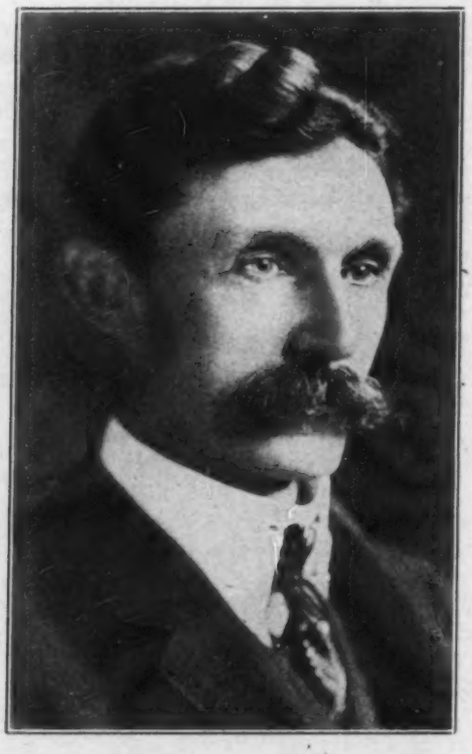
FORESTS.

Held in the Georgia Tech Library. The subjects were "Forests," Chairman Henry E. Hardtner, president Louisiana Conservation Commission, Urania, La.; "Practical Forestry Legislation for the Southern States," Hon. Harry P. Gamble, Winnfield, La., secretary Louisiana Conservation Commission. Capt. J. B. White, Kansas City, Mo.,

chairman Executive Committee National Conservation Congress and Mr. Peters, assistant forester United States, were other speakers.

GOOD ROADS.

Held in the Kimball House Ball Room. The subjects were "Good Roads," Chairman Leonard Tufts, Pinehurst,



J. A. HOLMES.

N. C., president Capital Highway Association; "Bond Issues and the Use of Convict Labor," Dr. Joseph Hyde Pratt, Raleigh, N. C.; "State Highway Commissions and Trunk Lines," W. W. Crosby, Baltimore, Md., State Highway Commissioner; "Permanent Maintenance and Skilled Supervision," Curtis Hill, Columbia, Mo., State Highway Engineer; "The Economics of Highway Improvement," J. E. Pennybacker, Washington, D. C., secretary American Association for Highway Improvement.

HEALTH.

Held in the Capitol, Room 313. The subjects were "Health," Chairman, Surgeon-General Walter Wyman, Bureau of Health and Marine Hospital Service; "Importance of the Collection of Vital Statistics," Dr. John S. Fulton, secretary-general of the International Congress on Hygiene and Demography, and ex-secretary of the State Board of Health of Maryland; "The Necessity of Avoiding Soil Pollution," Dr. H. F. Harris, secretary of the State Board of Health of Georgia; "The Value of the Medical Inspection of Schools and School Children," Dr. Oscar F. Dowling, president of the State Board of Health of Louisiana.

IMMIGRATION.

Held in the Capitol, Room 316. The subjects were "Immigration," Chairman T. V. Powderly, Washington, D. C., chief, Division of Information, Bureau of Immigration and Naturalization; "Railroads in the Distribution of Immigrants," F. H. LaBaume, Roanoke, Va., agricultural and industrial agent N. & W. R. R.

INSURANCE.

Held in the Taft Hall, Auditorium. The subjects were "The Field of Southern Insurance," W. S. Coleman, treasurer Georgia Fire Insurance Company; "Insurance," Major A. C. Sexton, Citizen's National Life Insurance Co., Birmingham, Ala.; "Life Insurance Companies and Their Benefit to the South," R. F. Moore, agency secretary Southern States Life Insurance Company; "Liability Insurance and Workmen's Compensation in the South," E. W. DeLeon, New York, president Casualty Company of America.

LAND RECLAMATION.

Held in the Capitol, Room 321. The subjects were "Land Reclamation," Chairman John A Fox, of Arkansas; "The Undrained Empire of the South," Jos. E. Ransdell, M. C., Lake Providence, La., president National Rivers and Harbors Congress; "Uniformity in State Drainage Laws," J. H. Small, M. C., Washington, D. C.; "Reclaiming the Arid Lands of Texas," M. L. Swinehart, Pecos, Texas.

MINES AND MINING.

Held in the Capitol, Representatives Room. The subjects were "Mining and Agriculture, the Double Foundation of National Wealth," Chairman Director J. A. Holmes, Bureau of Mines, Department of Interior; "The Wisest Utilization of Resources in the Southern States," Hon. John Hays Hammond, Washington, D. C.; "The Iron and

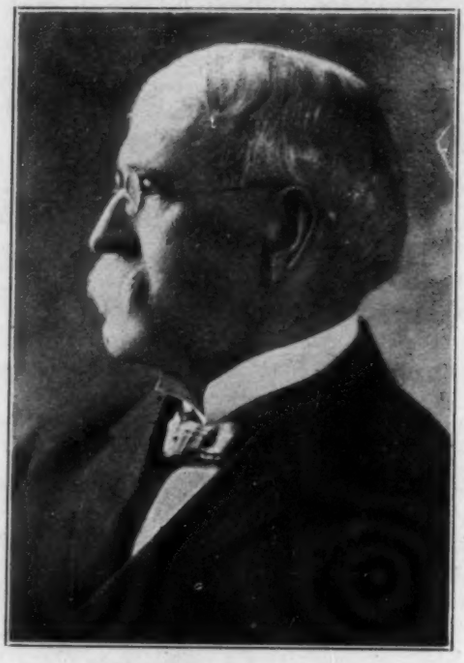


Photo By Edmondston.

T. V. POWDERLY.

Steel Industry in the Southern States," State Geologist Eugene A. Smith, Alabama; "The Building Materials of the South," State Geologist McCallie, of Georgia; "The Fuel Resources of the Southern States," State Geologist I. C. White, of West Virginia; "Phosphates and the Phosphate Industry," State Geologist Ashley, of Tennessee.

REAL ESTATE ADVERTISING.

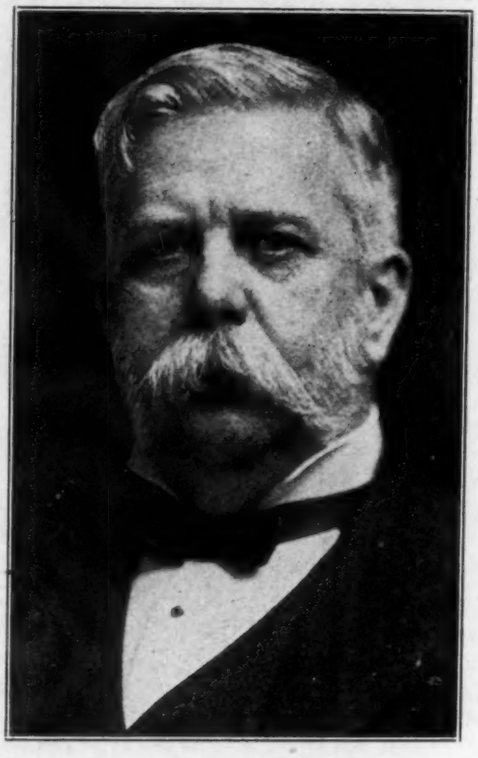
Held in the Piedmont Assembly Hall. The subjects were "Real Estate Advertising," Chairman Robt. Jemison, president Jemison Real Estate & Insurance Co., Birmingham, Ala.; "The Danger of Over-Pricing," E. L. Chappuis, New Orleans, La.

WATER RESOURCES.

Held in the Georgia Tech Chapel. The subjects were "Water Resources," Chairman John H. Finney, Washington, D. C., member A. I. E. E.; "The Significance of Southern Water Resources," Marshall O. Leighton, Washington, D. C., chief hydrographer Geological Survey; "Federal and State Co-operation in Water Power Development," Capt. W. P. Lay, Gadsden, Ala.; "The Ownership of Running Waters and Their Development," Philip P. Wells, Washington, D. C., counsel National Conservation Association; "Hydro-Electric Corporations, Their Duties and Responsibilities," Mr. Gano Dunn, Ampere, N. J., vice-president and chief engineer, Crocker-Wheeler Co., member A. I. E. E.

THE SOUTH'S HIGHER THOUGHT.

The program for Friday evening was late in starting and the immense throng became restless and insistent. It is estimated that the largest crowd ever gathered under one roof in the South were present to hear the distinguished speakers.



GEORGE WESTINGHOUSE.

"Electricity in the Development of the South" was the subject assigned to George Westinghouse, who was the first speaker of the evening. Mr. Westinghouse briefly described the many different applications of electricity which have been and are being made in the Southern States in all lines of business endeavor and then asked his hearers to take a look forward with him at what may be expected in the years to come.

He spoke of the possibilities of electricity in agriculture and horticulture; of the use of ultra-violet rays in the sterilizing of water and milk; and in the ageing of wine; of Hertzian waves; and of portable wireless telephones.

"In conclusion," he said, "I urge the young men of the South to make themselves familiar with industrial affairs by learning to be proficient in the use of their hands as well as in the use of their heads. My early greatest capital was the experience and skill acquired from the opportunity given me when I was young to work with all kinds of machinery, coupled later with lessons in that discipline to which a soldier is required to submit, and the acquirement of a spirit of readiness to carry out the instructions of superiors."

Dr. Henry S. Hartzog, secretary of the Arkansas Education Commission, of Little Rock, next addressed the Congress on "The South's Educational Obligation," which he treated in a very thorough manner.

A great deal of public interest was felt in the address of Governor Woodroe Wilson, partly because of his Southern affiliations and partly because of the probability of his receiving the Democratic nomination for the presidency. His subject was "The Citizen and the State."

GOVERNOR WOODROE WILSON.

With scholarly and distinctive phrases, Governor Wilson paid a beautiful tribute to Atlanta and the South. He said that some of the most stimulating years of his career had been spent in this section of the country. He asked that the Southern states should take a larger share in the direction of national affairs and expressed it as his opinion that its failure to do so in recent years, was due to an exquisite sense of pride growing out of the peculiar position that they occupied because they had thought they were not welcome to the life of the nation.

He emphasized the fact that the South was awake already and tense with the consciousness of her own life and therefore needed no further awakening on the part of anyone else. He referred to the traditions of the national life that had grown in the South and said that nowhere else in the country were there more unbroken, continuous traditions reaching back to the formative period of the government. "The South is now face to face with the problem of controlling the interests, who are coming into the South to develop your wonderful resources and what are you going to do with these interests? You enjoy

a singular advantage, gentlemen of the South. You have before you the record of the experiments and the mistakes made in the rest of the country. By taking advantage of these mistakes of others you will already attain a big start in the right direction." "I am a friend of capital," he said, "but that does not mean that I would link myself with any sort of capital to do harm to anybody else. We are seeking the common interest in the regulation of capital; the interest of capital, as well as the interest of labor; the interest of the poor as well as the interest of the rich. Any public service corporaion that honestly serves the public, should not be denied a fair profit, but the trouble with so many captains of industry is that they do not understand anything, but the business of their captaincy."

All who attended the address of Col. Roosevelt on the previous evening were greatly impressed by the similarity between the arguments by Col. Roosevelt and those advanced by Governor Wilson regarding the proper control of capital or corporations.

HON. J. M. DICKINSON.

The subject of the next address of the evening was the enforcement of laws in the South, by the Hon. J. M. Dickinson, Secretary of War.

While Mr. Dickinson's address was interesting in the extreme, it was listened to with more or less impatience by the large audience because of their anxiety to hear from President Taft, who followed with the subject "A Greater Nation Through a Greater South."

In reviewing the material prosperity of the South, President Taft expressed the hope that in ammasing material wealth the people of the South would not lose sight of the ideals that should control the nation. "Good business is not everything in life and the making and accumulating of money should not be the chief end of any community. Nevertheless prosperity and the accumulation of wealth, if the effort to acquire them is not too absorbing, are very essential to the proper development of a people in the promotion of refining civilization. I am glad to note that the cause of education has received a tremendous impetus all over the South. The appropriations by the Legislatures have been liberal and I look for a vast improvement in the thoroughness of education in the next ten years."

He later turned the course of his remarks to cover subjects of national interest and less of sectional interest, apologizing for doing so by saying that he felt sure that the people of the South were not so sectional as to confine their interest to Southern commerce and trade entirely. He praised highly the work of the 61st Congress which has just closed and gave them the credit of enacting more useful and progressive legislation in their three sessions than any Congress since the war. He reviewed with some detail the different work accomplished by the 61st Congress and admitted that one of the great disappointments of the session was the final defeat of a permanent tariff board of five to be appointed by the President.

In closing, President Taft earnestly appealed to the young men of the South "to take up these and other political issues from a broad and liberal standpoint, to eliminate from their consideration narrow partisanship and sectionalism and to come fully into our national communion with a patriotic purpose of stimulating the progress of our civilization in every direction and maintaining our country's prosperity, but always in subordination to higher ethical standards and to the promotion of righteousness and justice.

CONGRESS OF TECHNOLOGY.

What promises to be a very remarkable and striking record of the place of science in modern industry will be presented in the series of papers which will constitute one of the main features of the Congress of Technology to be held in Boston on April 10th-11th, of this year. The first of these dates is the fiftieth anniversary of the chartering of the Massachusetts Institute of Technology, and the primary purpose of the Congress is to observe that anniversary.

But the interest of the celebration goes far beyond any personal associations with the Institute of Technology. While "Tech," as its friends know it, has been a leader in the application of science in the industries, the progress of that institution and of its graduates marks the enormous development that has taken place in all industries the world over. A large number of Technology graduates who have been conspicuously successful in varied lines of engineering will present papers at the Congress, dealing with various aspects of the country's manifold industrial problems and treating those problems not only as they exist now but as they promise to take different shape in the future. The whole body of papers will therefore constitute a survey of engineering and industrial science as a whole, from a body of men who speak from first-hand experience with industrial problems all over the country.

The papers, separately, will discuss the conditions and prospects in specific industries and will therefore be of exceptional interest to the great number of men practically engaged in them. No similar discussion of the industries has been attempted on such a scale, and the record promises to be of unique suggestive value to the manufacturers of the country. The meetings will be open to the public.

Mill Conditions and Market Reviews.

SOUTHERN MILL SITUATION.

(*Special Correspondence.*)

One of the best posted manufacturers of the country, who is closely identified with the American Cotton Manufacturers' Association, says that he believes curtailment all over the South at present, and for several months past, will not amount to more than ten per cent. He thinks other estimates too high. He states further that he does not believe conditions will greatly improve before later in the spring, and that mills will have to follow an individual policy in the matter of curtailment, shutting down machinery when forced to do so. T. W. Crews, secretary of the Southern Hard Yarn Spinners' Association, says that so far he has seen no occasion to call a special meeting of his association to consider curtailment. Mills, he says, are curtailing as they find they must, and will keep up this individual policy. He looks for decided improvement in yarn markets by late spring.

An important feature of the month was the formation of what is known as the Carolinas and Virginia Hosiery Manufacturers' Association, composed of hosiery mills in North and South Carolina and Virginia. Organization was perfected at a recent meeting of 75 per cent of the hosiery manufacturers of that territory, held in Raleigh. C. McL. Carr, of Durham, N. C., was elected president; H. A. V. Packer, of Portsmouth, Va., vice president and Ernest Martin, of Raleigh, secretary and treasurer.

Mill men of the Piedmont section of the Carolinas were greatly interested in the final decision of Governor Blease, of South Carolina, to sign the bill chartering the Piedmont and Northern Railway, a $10,000,000 concern backed by the Dukes, which proposes to join the majority of large cities in both states with an interurban system of electric railways. Mill owners were large subscribers to stock.

Recently the Secretary of State of South Carolina chartered the Parker Cotton Mills Company. Capital stock of the new corporation is $10,000,000 and it includes the string of mills in which Lewis W. Parker, ex-president of the American Cotton Manufacturers' Association, is interested. Headquarters of the company will be in Greenville. The following reasons for the consolidation have just been made public:

"The present system whereby the mills are operated as different corporations under varying officers involves an economic waste in both executive and manufacturing departments. By unifying them under one organization this waste can be eliminated, and by systematizing the work the productiveness of the plants can be increased. The power to buy cheaply raw material and supplies and to market products to advantage will likewise be increased by a combination of the financial strength of the several corporations."

It is now proposed that the board of directors of the Parker Cotton Mills Company shall be composed of the following stockholders, who are largely interested; John Kerr Branch, of Thomas Branch and Co., bankers and brokers, Richmond, Va.; Edwin P. Frost, of Henry W. Frost and Co., Charleston, S. C.; H. J. Haynsworth, attorney, Greenville, S. C.; R. F. Herrick, of Fish, Richardson, Herrick and Neave, attorneys of Boston, Mass.; Thomas Motley, of Curtis and Sanger, bankers and brokers, Boston, Mass.; Lewis W. Parker, Greenville; Thomas F. Parker, president Monaghan Mills, of Greenville, S. C.; Edwin W. Robertson, pres. National Loan and Exchange Bank, Columbia, S. C.; and R. P. Snelling, of Saco-Pettee Co., machinery builders, Newton Upper Falls, Mass. The following will probably be the officers of the new corporation; Lewis W. Parker, president; Thomas F. Parker, vice president; Alex MacBeth, treasurer; and M. M. Trotter, Jr., secretary.

One of the latest combinations of mills effected is that of the Hamer, Maple and Dillon mills, of Dillon, S. C., the merged corporation having a capitilization of about $800,000. The combination of the three large mills was decided upon at a recent stockholders meeting held at Dillon. It is understood the new corporation will be known as the Dillon Cotton Mills. A committee of one was appointed from each mill to perfect arrangements for a consolidation. This committee was composed of Messrs. Allen Edens, A. J. C. Cottingham and R. S. Jackson. W. M. Hamer, now president and treasurer of each of the mills, was also elected as one of the committeemen. At the meeting in Dillon there was a full attendance of directors with the exception of Mr. Cottingham.

An interesting suit has followed the consolidation of the large mills at Danville. An appeal has just been allowed by the Supreme Court of Virginia in the case of W. R. Winfree vs. the Riverside Cotton Mills, the Dan River Power and Mfg. Co., and the Riverside and Dan River Cotton Mills Company. The case came up to the supreme court from the Corporation Court of Danville, Va., the location of the mills in question. The appellant had gotten an unfavorable decree. Winfree, who is a stockholder of the Riverside Cotton Mills, sues for himself and others similarly situated, for the purpose of having the court set aside and annul as illegal a merger agreement between the Riverside Cotton Mills and the Dan River Power and Mfg. Co., and restore petitioner and others to his or their rights as common stockholders of the said Riverside Cotton Mills. The merged corporation is known as the Riverside and Dan River Cotton Mills Co., and has a capitalization of $7,000,000. Mills represented are equipped with 230,000 spindles and make colored goods and white sheetings. R. A. Schoolfield is president.

Contract for 200,000 tons of coal f. o. b. at the mines has just been placed by the coal buying committee of the South Carolina Cotton Manufacturers' Association with the Clinchfield Fuel Company. Purchase price is not stated. Heretofore their coal has been purchased f. o. b. at the mills. It is said the Association is expecting a reduction of coal rates into the South Carolina territory as a result of the action now pending before the Interstate Commerce Commission.

An interesting suit came up at Statesville, N. C., being that of the Mooresville Mill, of Mooresville, N. C., against the Southern railway for damage to mill machinery shipped from Denver, Col., to Mooresville, and for overcharges. The

case was first tried in Federal court in Statesville and a verdict of $5,000 was rendered for damage to machinery and $750.00 for overcharges to the mill. Judge Boyd set aside the verdict of $5,000 for damages, and allowed the $750.00 for overcharges. The Court of Appeals reversed Judge Boyd on both points. The verdict of $5,000 for damage to machinery is allowed to stand and a new trial is ordered in the matter of freight overcharges.

Despite unfavorable market conditions, there has been considerable activity during the past few weeks in mill construction and improvement work. The regular contract for the construction of the Westervelt Mill, at Greenville, S. C., has just been awarded to the Gallivan Building Co., of Greenville. Dimensions of buildings are to be as follows: spinning and carding department 130x423.6 feet, two stories; weave shed, 301x231 feet, one story, with saw tooth roof; picker and slasher department 47.2x114 feet, two stories; boiler room 48.8x66.4 feet; warehouse, 102x154 feet, three compartments.

NEW ENGLAND MILL SITUATION.

(Special Correspondence.)

Curtailment of production in the fine combed yarn and the print cloth mills of New England has increased materially in the past few weeks. Fully 12,000 looms are idle in New Bedford, the centre of the combed yarn industry, and Fall River has lessened its output 50,000 pieces a week below normal. Many mills that are running full time have substantial percentages of their machines idle and some mills have now entered upon a policy of running four days, or five days a week, until the relation of selling prices for goods and the costs of production are more equitably balanced.

Manufacturers and selling agents believe that the jobbing season has advanced to a stage where curtailment of production cannot affect prices, except possibly to steady them. Predictions for the long future are being influenced by varying opinions concerning the maintenance of values in the staple pending the full opening of the planting season. The continued conservative purchases of staple goods by retailers and jobbers make it difficult for mill men to predicate future operations on the demand for merchandise.

Hopes that March will witness the most severe part of the depression for the year are very general, yet the prospects of an extra session of Congress or some other unsettling phases of general business that may develop, are referred to by treasurers as influences that may upset all calculations. The steady disappearance of all margin for profit on sales has led some of the strongest corporations to adopt a conservative attitude.

The curious condition exists of several financially strong organizations being forced to curtail, while others no better situated are running along fully employed. The explanation is found in the varying volume of demand for different fabrics. All of the large gingham mills have every available loom under order and they will be kept busy during the summer, owing to the large demand of the past few weeks for dress ginghams in fall colorings and designs. The Amoskeag Company will offer no fall ginghams as such, but it will shortly bring out its new designs in the 32-inch cloths it showed last season for the first time. The styling of the Barnaby ginghams has been completely changed and the sales for fall delivery have been large.

The month has witnessed a remarkable demand for staple ginghams. Jobbers had little confidence that the 7 cent price would be maintained after October 1st, to which date the price had been pegged, and they did not place orders very generally. The consequence was that the few large concerns whose orders were in were called upon early in the month to sell in bulk to other wholesalers as the latter could not secure deliveries from stocks at the mills as there were no stocks to draw from. The consequence was the placing of orders in bulk lots so that at the present time the principal producers have orders for staples that will carry into June, at least. Such mills as the Everett, Lancaster, Bates, Parkhill, and Amoskeag will not be able to curtail.

Mills making domets, canton flannels, mottled flannels, and flannellettes, as well as all of the mills making cotton blankets, have gathered a full volume of orders for fall delivery. Prices were so close that profits will be limited, but these mills will find it possible to run steadily into the next cotton year. This includes such mills as the Nashua, Jackson, Tremont and Suffolk, Appleton, Hamilton, Massachusetts, Whittenton, Esmond, Beacon, and others. The three largest cotton quilt mills in New England are also well supplied with business for some time to come. The Monument mills at Housatonic, Mass., which recently added 25 quilt looms, the Stevens at Fall River, the Monadnock and Bates in New Hampshire and Maine, are also busy.

The printers are busy and bid fair to run very steadily for some weeks to come. It is distinctly a printed goods year in the markets. A much larger volume of business could be taken care of if it were offered, but in contrast with bleachers, dyers, and finishers, the printers have no fault to find. The Pacific is particularly busy on many varied lines, its percales having been sold up for the fall season, and the demand for fancy prints, draperies, and other products being very gratifying. The Arnold works at North Adams are running in full on job work for the large New York converters. The American and Algonquin at Fall River are having a good run on staples, principally in sub-counts. The American has been buying Southern print cloths freely in the past month. The Merrimack has had an excellent year on printed lawns and has gathered a good business also on fleeced goods for fall delivery. The S. H. Greene & Sons Corp., at Riverpoint, R. I., has been very busy on subcount prints sold under the Sheffield ticket.

The bleachers and finishers have been running out of orders during the month. They have cloths enough to work on, but converters are not putting them into process because of the indifferent re-order demand that has been noted in the markets. It is noted that when orders are given the goods are wanted very promptly and it is reasoned that stocks are low in distributers' and retailers' hands. Bleachers of staple goods are running very light and finishers of fine lawns, linens, fine cambrics, and similar goods have been getting little new business.

It is in print cloth and fine goods centres where the effects of quiet trade are seen most clearly. Reports have been published to the effect that Rhode Island mills will not

curtail and they are misleading in the sense that curtailment by stopping various sections in different mills has been going on for some time. It is not likely that any plan of short time will be adopted but the largest concerns are not turning out more than 85 per cent. of a possible full output and several concerns are not producing 75 per cent. In Fall River there are some mills running short time, but most of the curtailment there is being carried out by stopping different departments of the mills for a day or two a week or by shutting down sections of looms when the warps run out. This is the policy that is being followed in New Bedford, where some mills with more than 2,000 looms in their sheds are not operating much more than two thirds of them. This entails the stopping of carding and spinning. Stocks of goods on hand are not large. At Fall River, the sales of the month coupled with goods deliverable on old contracts have held stocks down to about the volume reported a month ago, or less than a million and a quarter pieces. This is a very moderate stock for this center where there are 90 mills.

The fine combed yarn goods mills have suffered from a lack of orders and a falling away in the values of goods made. The plain constructions of lawns, linens, etc., are from three-fourths cent to one cent per yard lower than the top prices of last year and there has been no reduction in producing costs in the meantime. Relatively speaking, fine goods manufacturers say there is less profit in the business now, than when cotton was very much cheaper and goods prices very much lower. In the last week of the month the inquiry for goods was better than it had been but prices were still most unsatisfactory.

The large mill machinery shops are still running short time. During the month some fair sized orders were received for automatic looms by the Draper Company and other shops have secured a small business in different directions. The American Machine Co., at Pawtucket went on short time for the first time in some months but it is understood that this has been due in large part to delays in completing the buildings into which new machinery will go later on. This company and the Whitin Machine Works have managed to keep running pretty regularly.

The cotton yarn mills have been increasing the number of idle machines during the month. This trend is seen in various directions but principally in closing down machinery while keeping the engines running on full time. The Quisset yarn mill, a new 60,000 spindle proposition in New Bedford, to spin combed yarns from 15s to 120s will begin placing its product on the market in the next few weeks. Despite the conservatism in trade circles interest in cotton mill investments is well maintained. The newer propositions, such as the Nashawena of New Bedford, have been forced to do some additional financing, but on the whole the stockholders have not been disturbed. The Middlesex Company of Lowell has been re-financed and is now installing machinery for cotton hosiery to be sold through Lawrence & Co., who also handle the Ipswich account.

In view of England's strong hold on the trade of the Orient, the hope of American manufacturers in this market lies in expanding their trade in special brands of goods which already hold a commanding position in the East because of quality and popularity.

MONTHLY REVIEW OF THE COTTON MARKET.

BY H. AND B. BEER.

The market appears to be gradually generating more strength as a result of the statistical position of cotton becoming stronger in the United States, especially in the South. At the close of December the visible supply in America was about 400,000 bales larger than one year ago, to-day it is about 13,000 bales smaller than one year ago, and there is on shipboard at the moment 127,000 bales at all U. S. ports against 125,000 last year. Exports thus far this season total 6,137,000 bales against only 4,484,000 one year ago and 6,208,000 bales for the whole of last season. In other words it looks as though America will have shipped as much cotton during the first six months of this season as was shipped during the entire 12 months of last season, being only 61,000 bales behind, up to yesterday. The movement to market to date is 10,202,000 bales against 8,561,000 last season, being 1,641,000 larger, but exports to Europe for the same period have been 1,653,000 more than one year ago, or 12,000 bales in excess of the "in sight" to date.

While the world's visible supply of all kinds is 305,000 bales larger than in 1910, 4,913,000 against 4,608,000, the entire excess is afloat and in store in Europe where it will be made use of, whereas there is only 1,307,000 bales in America compared with 1,320,000 last year. While it is true that trade conditions in the textile line in America are far from being satisfactory, it is also true that stocks are comparatively light. Going deeper into the situation the facts are disclosed that even if the commercial crop is 12,250,000 bales, there could only be received during the balance of this season exactly the same amount of cotton that was marketed after this time last year, 2,048,000 bales against 2,049,000 bales. But the hidden possibilities of the market appear to be even stronger than are the surface indications. Suppose that the commercial crop is only 12,000,000 bales, and there are many people who think it smaller, less cotton would come into sight for the balance of this year than was brought in during the remainder of last season by 250,000 bales.

In this connection we beg to call attention to the fact that the final Census report on quantity of cotton ginned this season, and which will include linters, will be issued on March 20th. Irrespective of what the commercial crop will be, the general opinion is that the Census report will show less than 12,000,000 bales, as only 599,000 bales were accounted for from January 16th to March 20th last year, whilst only 11,254,000 bales were reported ginned to January 16th of this year. The railroad rate decision did not disturb Wall Street as much as expected, and it is said there is little likelihood of the Scott bill passing, all of which is in favor of cotton.

A marked improvement has come over the industrial situation in the United States during the past two weeks. With depleted stocks, merchants, while still conservative in their operations, are displaying greater activity. The expanding reserves of the banks and the rapid recovery in the condition of the iron and steel trade is making a deep impression on business sentiment, and the general financial and

mercantile position, in consequence, is stronger than current statistics indicate. The further reduction in the Bank of England discount rate to 3½ per cent. is a favorable feature. The increase in unfilled orders and in blast furnace output by the principal steel producers is another favorable development. And another favorable feature is the improved condition of grain crops in the Southwest, the recent rains having been timely and very beneficial, and have made the outlook for the next cotton crop more favorable. The decline in the price of raw cotton served to readjust conditions between the producer and consumer, and there is every reason to look for a revival in business.

The only unfavorable development of late has been the decision of the Interstate Commerce Commission against the raising of classified rates by the railroads of the East and West. It was pointed out, however, that the net earnings of the railroads for the year ending June 30th, 1910, aggregated $51,000,000 more than during the year 1909, in which period the increase in labor accounts was only 5 to 8 per cent. of their pay rolls, aggregating for the forty one lines approximately $39,000,000. Nevertheless, it is said that the decision will deprive the roads of about $27,000,000 per year in revenue, and that instead of having the public to foot the bill, the railroads will have to stand the expense of raising money with which to make extensions and to improve their systems. What effect this will have on business remains to be seen.

As to the outlook for the new cotton crop, conditions are favorable at the moment. Generous, well distributed rains have been had all over Oklahoma, Texas and the entire cotton belt of the whole South, and the recent freezing weather is said to have destroyed insect life in the open. Preparations for planting are reported to be well advanced in all sections of the belt, the soil is said to be in splendid condition, and if occasional good rains are had during the growing season, a large crop can reasonably be looked for, as the acreage is expected to be increased about 5 per cent., which would provide nearly 35,000,000 acres against 33,196,000 last year.

THE YARN MARKET.

The past month in the yarn market showed very few, if any, bright spots. Some of the shrewdest operators in the market declared that there is more short selling, than has been the case for years. The declining cotton market is taken as a basis by operators wishing to speculate by short selling on yarns and there seems to be some chance for their success. Close students of the cotton market are looking for a jump in prices and in such an event, there would be a scramble among the short sellers of yarns to cover. Another feature which assisted in driving the quotations down was the pressure exerted by spinners for business to carry them over for a month or two. It is reported that at the beginning of the break in yarn prices, two of the most conservative houses in the market, houses that have the reputation of never speculating, but always doing a strictly commission business, were well in the front of the price cutting procession.

This was done, it was said, that the mills they controlled could get business. They got the business, but at the expense of the market. Northern and Southern spinners had an idea that an active demand for combed yarns would develop, and acting on this idea they produced quite an amount of these yarns for stock. As this demand failed to develop there is a large amount of this yarn in the market and many believe that the combed yarn situation is worse than that of carded yarn. All fine yarns were quiet and offered at steadily declining prices. For many weeks past the yarns received were far in excess of shipments and for the past month this is particularly true of Southern yarns. Tape manufacturers have been doing little and wire manufacturers have been out of the market to a large extent. The knitting trades are moderate buyers, but they are endeavoring in every way to use current quotations as a basis to depress the prices for the new contracts which they wish to place for the late months. While there are conflicting reports as to the condition of the market, it is safe to say that the worst is over and the outlook for the future fairly good.

The month opened with a dull and weak market, continued price cutting and bearish tactics on the part of speculative dealers. This and commission cutting by some other dealers, made it very difficult for regular traders to do business in the legitimate way. The market conditions were the same for both combed and carded yarns. It was reported that in some markets quite large quantities of some numbers of yarns were being held on consignment by comparatively few firms. Coarse yarns were relatively better sellers than the higher counts. The prevailing feeling at this time was that cotton had about reached the bottom and that retailers who had a good business would necessarily be obliged to come into the market to buy and the reflection of this buying, would of necessity show up in the form of a firmer and more active yarn market.

The market continued to grow weaker as the month advanced, but it is pretty well understood in the trades that users are in need of yarns and are holding out with the idea that prices may work still more in their favor. It was reported that some users of yarns were swapping stocks with each other in order to keep out of the market for a time. Also some dealers were accommodating each other in order to avoid buying from spinners. Some spinners were open to any reasonable offer of business, while others held to their quoted prices rigidly. Knit underwear manufacturers in New York and Pennsylvania, while continuing to accept deliveries on old contracts were placing only a very limited amount of new business.

The Boston market showed a somewhat better demand for cotton yarns and a fair sized volume of business was done in some cases. These conditions made no noticeable increase in the price. The drop in the prices of Egyptian and Sea Island yarns showed neither tendency for reaction, nor for further decline. Dealers and producers viewed the market at this time with much more satisfaction than at this period in January. There was much general talk of improvement in market conditions to take place between the middle and last of February.

The latter part of the month showed a slight increase in the volume of purchases by the webbing and weaving trades and a little falling off in buying for knitters. The general tone of the market however was weaker. The break in the price of cotton helped to demoralize the yarn market. Northern spinners seem to be more ready to cut prices than do their Southern competitors and the latter have been feeling this competition in all grades and numbers. An-

other complication in the situation is the efforts that are being made by many spinners to save a dealers commission by selling direct to the consumer. Quotations are so irregular that the prices quoted practically mean nothing. One price today and another price tomorrow seems to be the general rule. Purchasers who bought early in the month at what looked like low prices, now wish they had waited for the present quotations. Southern mule yarns were offered as low as 21½ cents for 10s and 50,000 pounds of mule 12s were sold at 22 cents. Eastern spinners are cutting prices on combed yarns in order to secure business sufficient to keep the mills operating. Most of the buying is for yarns to be delivered within the next two months. The month closed with a continuation of the sagging markets and prices a shade lower. The following are the New York quotations at the end of February:

SOUTHERN SINGLE SKEINS.

4s to 8s	20 @21	20s	23 @..
10s to 12s	21 @22	22s	24 @..
14s	21½@22	26s	24 @24½
16s	22½@..	30s	25 @..

SOUTHERN TWO-PLY SKEINS.

4s to 8s	20 @21	36s	28½@29
10s to 12s	21½@22	40s	30 @31
14s	22 @..	50s	36 @37
16s	22 @22½	60s	44 @46
20s	23 @23½	3-ply 8s upholstery	22 @..
24s	23½@24		
26s	24 @24½	4-ply 8s upholstery	22 @..
30s	24¾@25		

SOUTHERN SINGLE CHAIN WARPS.

10s to 12s	21 @21½	24s	23½@24
14s	21½@22	26s	24 @24½
16s	22 @22½	30s	25½@26
20s	22½@23	40s	30 @31
22s	23 @..		

SOUTHERN TWO-PLY CHAIN WARPS.

8s to 10s	21 @21½	26s	24½@..
12s to 14s	21¾@22	30s	24¾@25
16s	22½@23	40s	30 @31
20s	22½@23	50s	37 @37½
24s	24 @24½		

SOUTHERN PEELER FRAME CONES.

8s	22 @..	18s	23 @23¼
10s	22¼@..	20s	23¼@23½
11s	22 @22¼	22s	23½@..
12s	22½@..	24s	24 @..
14s	22¾@..	26s	24½@..
16s	22¾@..	30s	25¾@26

THE KNIT GOODS MARKET.

The principal features of the past month were the continued demand for silk hosiery in the medium grades; the steady call for gauze lisle goods for both men and women; the continued shortness of stocks of women's light weight underwear to retail around 25 cents; and the general demand for men's balbriggan underwear for the spring trade. The opinion is generally current that there is to be a large trade in the latter goods and that they will, for the most part, replace the nainsook garments which have been so popular for the past few seasons. It is noticed by many careful followers of conditions in the underwear market, that purchases of nainsook garments on the part of buyers, are not of the proportion of seasons past. However, the demand for woven underwear may materialize at some later date, as it is still too early to say with any certainty what the prevailing demand will be.

The stocks of the cheaper women's goods to retail at 25 cents, reached such a low point, that some manufacturers diverted machines from other lines of goods to help keep this grade in the market. A bad feature of the situation, which is bound to come at a later date, will be a hurry call for this cotton underwear, when the buyers are forced into the market by the actual need of the merchandise. There seems to be a strong tendency on the part of the manufacturers to eliminate the middle men and sell well advertised and trade-marked goods direct to the retailer. This tendency is not confined to the underwear manufacturers, but is also being exploited extensively by manufacturers of hosiery and novelties. It is probable that this direct selling proposition will gather strength year after year, as this cutting out of the profit of one handler of the goods allows the manufacturer to deliver a better quality of merchandise without making an increase in the price.

The tendency on the part of the consumer to wear sheer weight hosiery even during the winter months, has affected the markets strongly. Heavy grades of goods have moved very slowly. It is predicted that there will be a shortage of staple lines later on and it would not be surprising if such eventually be the case. The greatest demand still continues to be for silk hosiery, although it is said that the cheaper grades are not serviceable. It is difficult to see just why the public calls for this grade of goods so insistently. Manufacturers, however, can not be blamed for supplying the demand as long as it keeps up. Lisle goods seem to be replacing the cheaper lines of silk to some extent however. The great cry is for black sheer goods and the greater part of the hosiery seen is of this description, particularly in women's goods. A few colors are seen in half-hose with dark heliotrope as a favorite. There are some very pretty hose in some of the better qualities, in embroidered lines. Some novelties in fine ribbed hose are to be seen and consist in the placing of some dark color between the ribs of black so as to give a sort of changeable effect when on the wearer.

The month opened with a very quiet market. Those who made purchases during buyer's week, withdrew apparently satisfied with what they had already purchased. The business done during buyer's week was mostly of the confirmatory variety, but the number of orders booked up to this time was fully equal to those of 1910. Some mills making cotton underwear of a standard quality had booked a very comfortable amount of orders. Other mills could not sell goods at prices that would attract buyers. Sellers were not accepting orders for merchandise at low quotations because they saw little hope of lower prices in the yarn market. On the other hand, buyers seemed to be strongly of the opinion that the cotton market would break and thus assist in forcing lower prices. But few repeat orders had been seen at this time, although February is the month that duplicate orders generally begin coming in. Ladies' goods in the 25 cent varieties were very hard to find in quantities, and many standard grades of union suits for both men and women were practically sold out. Standard balbriggans were sold virtually up to the manufacturer, while substandard and inferior grades were being neglected by buyers. In hosiery, spring duplicates came to hand in a much more encouraging manner. Goods were being sold however at the closest prices on record. Silk goods still continued as the best sellers. Cotton hosiery for fall trade also sold freely.

The middle of the month found the hosiery trade on staples continuing very quiet. Most of the large distributors of fleeced goods had placed their orders with the manufacturers of the best known staples. Nearly all orders for spring goods were for immediate delivery and mostly for small amounts. Such orders confirmed the opinion of man-

ufacturers that buyers were taking goods just as they were needed and not anticipating to any extent. Sheer goods were taken the most freely and although some orders were given for fancy hosiery, the demands were not heavy. Solid colors and staple goods were given the preference. Underwear buyers were still balking at prices and manufacturers and sellers did not care as a rule, to take any reckless chances. Jobbers are admittedly in need of goods and sellers feel that it is but a matter of time when they, the jobbers, will be forced into the market. The condition of stocks in second hands seems to warrant this assumption. The best grades of balbriggans have sold well, jobbers taking them in larger quantities than the preceding season.

The later part of the month found considerable spot business in spring sweaters, golf coats, and automobile jackets for women and misses. There is also a much stronger call for knitted caps in the form of tam-o-shanters than was in evidence last year, only this year they call them automobile caps. This style of head gear for out-of-door sports is increasing in popularity and as they give a quick profit and offer reasonable returns on the turn over of stock, they are also popular with the manufacturer, jobber and retailer. There is also present an immediate demand for medium grade men's balbriggan underwear. Fashioned hosiery is in fair demand. The calls for sheer hosiery at popular prices continue to expand beyond the power of many mills to meet them. The call for low grade staple hosiery is still very slow and spotty. Boy's ribbed hose and a few children's lines made a good showing, but this was more because of the unusual quietness of the general markets than the large amount of goods turned over. The cheaper lines of silk hosiery in both half-hose and women's goods are selling freely and with the thin mercerized lines to retail up to 25 cents, are decidedly the leaders. A few good orders for fall fleeced goods showed up in the late trading. These orders, however, have failed to come up to expectations. There was some little improvement in duplicate orders for spring. Taken "by-and-large," the whole tendency of the buying side of the market seemed to be towards standard lines of knit goods and advertised specialties, which are sold either direct to the retailer by their manufacturer, or trade-marked after they leave his hands by a distributor.

COTTON MANUFACTURING.

COTTON MILL MACHINERY CALCULATIONS.

DISCUSSION OF MOTION—DRAFT—CALCULATING DRAFT FROM GEARING—INTERMEDIATE DRAFTS—BREAK DRAFT.

(Contributed exclusively to COTTON.)

BY B. M. PARKER.

PART I.

The object of this series of articles is to give a comprehensive review of all the calculations that are used in handling machinery in the modern mill, including speeds, drafts, twists, productions, changes, etc., and in such a form that the articles will be a help to those who are trying to learn in the mill, and that those in the business will have an accurate and complete discussion of the subject that can be referred to for any diagram and calculation relating to any textile machine from the picker to the twister.

MOTION.

When two gears are meshed together, such as A and B, and motion is given to one, A, the speed of the other, B, will depend upon the speed of A, the number of teeth in A, and the number of teeth in B. If A and B have the same number of teeth, the speed of B will equal the speed of A. If A has twice the number of teeth of B, the speed of B will be twice the speed of A; and if B has twice the number of teeth of A, the speed of B will be one-half the speed of A. Suppose A to have 40 teeth and B 20 teeth, then the relative speed of B as compared with the speed of A, will be 40 ÷ 20 or 2; and if A is making 10 revolutions per minute, the speed of B will be twice the speed of A or 20 revolutions per minute. If A had 90 teeth and B 30 teeth, then the speed of B would have been three times the speed of A. If A was making 25 revolutions per minute, the speed of B would have been $3 \times 25 = 75$ revolutions per minute. In other words; the speed of B will always be to the speed of A, as the number of teeth in A is to the number of teeth in B.

Looking at this in another way, we can say that the speed of A, multiplied by the number of teeth in A, will always give a product that will be the same as the product of multiplying the speed of B by the number of teeth in B. Putting this in the form of a rule, we have:

The speed of A multiplied by the number of teeth in A, and this product divided by the number of teeth in B will give the speed of B.

This is always true and must be kept in mind in dealing with speed calculations. Taking the last problem above, the speed of B is found as follows:

$$\frac{25 \times 90}{30} = 75 \text{ revolutions per minute, speed of B.}$$

If gears A and B are separated by one or more intermediate gears, as shown in Fig. 1, the same statements hold good, as the intermediate gears C and D simply serve to transmit the motion of A to B, and will in no wise affect the speed of B regardless of the number of teeth in either one of the intermediates. Such gears are used simply to fill in the space between A and B or to change the direction of motion of B, and are called "idler" or "carrier" gears. When a gear receives motion at its axis or center, by virtue of being attached to a revolving shaft and conveys this motion, through its outer edge or rim, to another gear, it is a driving gear or driver; and any alteration in its speed or the number of teeth will directly affect the speed of all the gears controlled by it in the same proportion. In Fig. 1, A is a driving gear and by doubling its speed or number of teeth will double the speed of B.

When a gear receives motion at its outer edge or rim and conveys it thence to its axis before affecting any other gear, it is a driven gear. In Fig. 1, B is a driven gear, and any change in the number of teeth of B will affect its speed in inverse ratio; as doubling the number of teeth of B will divide its speed by two and consequently the speed of any gears controlled by the shaft on which B is located will be affected the same way.

When a gear receives motion on its outer rim and conveys it along its rim to another gear, it is an idler gear or "carrier." Any change in the number of teeth of such gear has no effect on the speed of any of the succeeding gears in the train. A gear may act as a carrier in relation

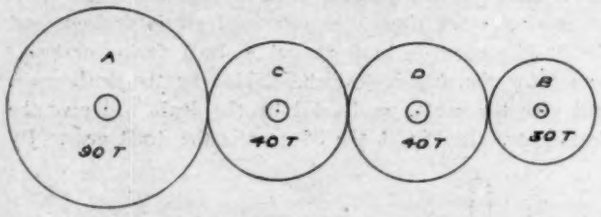


FIG. 1. DIAGRAM ILLUSTRATING A SIMPLE TRAIN OF GEARS IN MESH.

to one train of gearing and also as a driver or driven gear in relation to another train of gearing.

In the form of gearing shown in diagram Fig. 2 we have a different arrangement. A and B are connected by means of two gears C and D and a shaft E, the two gears C and D being fixed on the shaft E, which means that they will have the same speed, regardless of the number of teeth they may have. The gears C and D are not carrier gears, as D receives motion at its rim from A and passes the motion to the shaft at its center, while C receives motion at its center from the shaft and transmits it to B at its rim. Suppose A to have 40 revolutions per minute; then the speed of D will be:

$$\frac{40 \times 90}{30} = 120 \text{ revolutions per minute.}$$

As the speed of D is 120, the speed of C will also be 120, and we can take this speed and follow same rule to find the speed of B as follows:

$$\frac{120 \times 50}{40} = 150 \text{ revolutions per minute.}$$

Finding the speed of B in one operation is a matter of simply combining the two formulas as follows:

$$\frac{40 \times 90}{30} \times \frac{50}{40} = 150 \text{ revolutions per minute.}$$

In the above it will be seen that gears A and C are drivers, and D and B are driven gears.

PULLEY CALCULATIONS.

In dealing with pulleys the same statements and rules as for gears hold good, using the pulley diameters instead of the number of teeth.

Rule for pulleys:

Multiply together the speed of the driving pulley and its diameter, and divide by the diameter of the driven pulley. The quotient will be the speed of the driven pulley.

There are several ways of stating the above rule, but the one given is very simple. The main point to remember is that the product of the diameter and speed of the driving pulley in all cases will be the same as the product of the speed and diameter of the driven pulley.

Example: Suppose the driving shaft in a mill to be running 300 revolutions per minute and has a 10-inch pulley on it driving a machine that has a 20-inch pulley on it. The revolutions per minute of the 20-inch pulley would be:

$$\frac{300 \times 10}{20} = 150 \text{ revolutions per minute.}$$

Suppose you knew the required speed of shaft of the machine, the size of its pulley, and the speed of the driving shaft, and wanted to find the size of the pulley to put on the driving shaft. The products of the speeds and diameters must be equal, so that the product of the speed and diameter of the known pulley, divided by the speed of the required pulley will give the diameter of the required pulley.

$$\frac{150 \times 20}{300} = 10 \text{ inches diameter of pulley to use on shaft to give correct speed of machine.}$$

So far we have dealt only with speeds of rotation expressed in revolutions per minute. In many calculations we use the surface or circumferential speeds of pulleys and different parts of machines. The circumference of any pulley or roll is equal to its diameter multiplied by 3.1416.

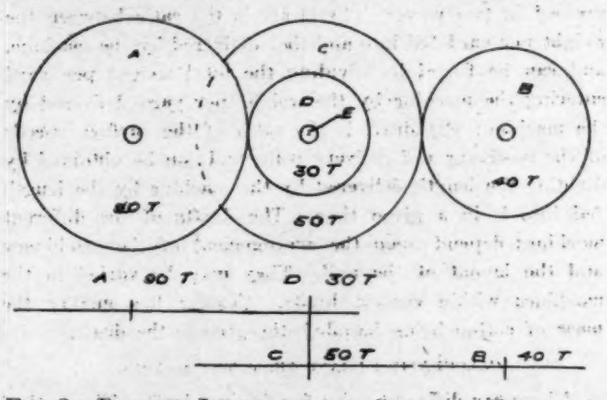


FIG. 2. DIAGRAM ILLUSTRATING A COMPOUND TRAIN OF GEARS IN MESH.

The surface or circumferential speed of any pulley or roll is equal to its circumference multiplied by its revolutions per minute. In the preceding example, the pulley on the shaft would have a surface speed of:

$300 \times 10 \times 3.1416 = 9{,}425$ inches or 785.4 feet per minute. The pulley on the shaft of the machine must take up as much belt as is delivered by the pulley on the driving shaft, that is its surface speed must be equal to the surface speed of the driving pulley: $20 \times 150 \times 3.1416 = 9{,}425$ inches and by dividing by 12 will give 785.4 feet surface speed of the pulley on the shaft of the machine.

The preceding explanation should enable any one to understand all the calculations relating to speeds as they may come up later on.

DRAFT.

Every machine that operates on the cotton from the time it is opened in the picker room until it is spun on bobbins in the spinning room in the shape of yarn, has a certain amount of draft. It will be well to find out exactly what draft is before we attempt to figure drafts on

the machines. The object of draft in cotton mill machinery is to secure a gradual reduction of the mass of cotton as it is fed into the pickers to the size of the spun thread as it leaves the rolls of the spinning frame. Every machine has its part to perform in reducing the bulk or weight. Draft, then, is a reduction in bulk or weight, and an increase in the length of the material under operation and is therefore the relative surface speed of the feed roll and delivery roll of the machine.

To illustrate: Suppose a machine receives cotton at the rate of 10 yards a minute and delivers it at the rate of 60 yards a minute, or six times the length it receives, the draft of the machine will be six, that is, for every yard received it would deliver six yards. It must be remembered, however, that as the length of the material increases its weight per yard decreases, hence one yard at the front of the machine will weigh only one-sixth of the amount of the same length at the back of the machine. If the material entering the above machine weighed 60 grains per yard the total weight fed in per minute would be 600 grains. The machine must turn out the same weight in the same time as is fed into it, as there will have to be 600 grains fed out per minute, but this weight must be spread over the 60 yards instead of 10 yards and each yard will weigh only 10 grains or one-sixth of what it did when fed into the machine.

From the above it will be seen that draft can be expressed in two ways: (1) Draft is the ratio between the weight per yard fed into and that delivered by the machine, and can be found by dividing the total weight per yard entering the machine by the weight per yard delivered by the machine; (2) draft is the ratio of the surface speeds of the receiving and delivery rolls, and can be obtained by dividing the length delivered by the machine by the length fed into it in a given time. The drafts of the different machines depend upon the arrangement of the machinery and the layout of the mill. They may be varied in the machines within certain limits. Usually the smaller the mass of cotton being handled, the greater the draft.

CALCULATING DRAFT FROM THE GEARING.

There are different rules for finding draft. The method illustrated below will prove easy of application, suits the most complicated gearing found, needs no considering of driving and driven gears and, from actual experience, is found to be the easiest understood and worked.

Draw a straight horizontal line; put the diameter of the front roll above the line, the number of teeth in the gear on the front roll under the line, the next gear meshing into it above the line, the next under. Continue this until the diameter of the back roll is reached which naturally comes under the line. Leave out all carrier gears in thus preparing for the calculation. Multiply together the figures above the line and divide this product by the product of all the figures under the line. The answer will be the draft of the machine.

The points to be noted are: Always start the calculation with front roll diameter over the line and finish with the back roll diameter under the line. If all idler gears are left out of the calculation there will be the same number of figures above as below the line.

Fig. 3 represents three drafting rolls connected by gearing and illustrates the arrangements found on fly frames, Applying the rule just given, we get the following:

$$\frac{1\frac{1}{8} \times 100 \times 56}{37 \times 34 \times 1} = 5 \text{ draft between front and back rolls.}$$

In all cases it will simplify matters to express the diameters of the two rolls in the same terms. In the above the 1⅛ inch front roll can be expressed as 9, and the back roll as 8.

In every train of draft gearing a "change" gear is located at some convenient point. By changing the size of this gear, the ratio between the surface speeds of the delivery and feed rolls is changed, thus changing the draft. This gear is spoken of as the draft change gear or draft gear. It is not necessary to work through the entire train of gearing every time a change in draft is desired, and the usual custom is to work out a draft factor or "constant" for the machine which, divided by the draft gear, will give the draft, or divided by the draft will give the draft gear. In Fig. 3, the 34 gear is the draft gear. By

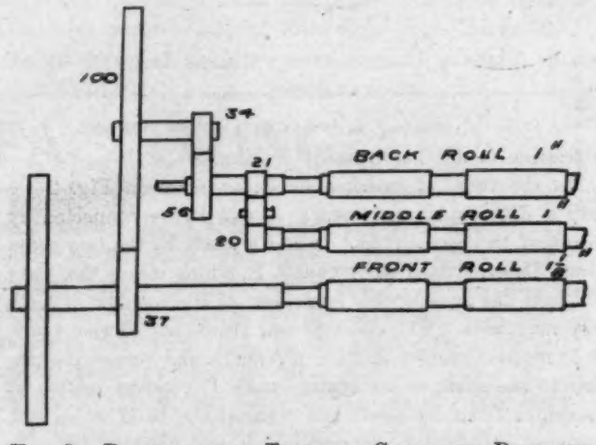


FIG. 3. DIAGRAM OF A TRAIN OF GEARS FOR DRAFTING ROLLS.

leaving this gear out of the calculation for draft just given, but retaining all the other figures in the same relative positions, we get the draft factor, as follows:

$$\frac{9 \times 100 \times 56}{37 \times 1 \times 8} = 170.27 \text{ draft factor.}$$

To find the draft:

$170.27 \div 34 = 5$ draft.

To find the draft gear:

$170.27 \div 5 = 34$ draft gear.

From the above we get the following rules in regard to draft that apply to practically every machine in use in the mill:

Factor ÷ draft = gear.

Factor ÷ gear = draft.

Draft x gear = factor.

INTERMEDIATE DRAFTS.

In the foregoing only the draft between the front and back rolls, or the total draft has been considered. The total draft on every machine is split up into two or more intermediate drafts. Referring to Fig. 3 there will be noticed two different drafts, namely, the draft occurring between the front and middle rolls; and the draft occurring between the middle and back rolls. The draft between any two such intermediate points can be found by apply-

ing the foregoing rule always considering the two points, namely, the receiving and delivery rolls under discussion, regardless of their relative positions to the other rolls in the machine. Figuring the draft between the front and middle rolls in Fig. 3 we get:

$$\frac{9 \times 100 \times 56 \times 20}{37 \times 34 \times 21 \times 8} = 4.77 \text{ draft.}$$

The draft between the middle and back rolls is found by same method.

$$\frac{1 \times 21}{20 \times 1} = 1.05 \text{ draft.}$$

In this case we must consider the middle roll as the delivery roll of the two. The product of all the intermediate drafts of any machine is equal to the total draft. Taking the two intermediate drafts above we find their product is 5, which is the same as the total draft previously figured.

BRAKE DRAFT.

In changing the total draft of a machine, by making a change in the size of the draft gear, we alter only one of the intermediate drafts, the other drafts in the machine remaining the same. In the above case any change in the draft gear will effect the total draft between the front and back rolls, but will not effect the draft between the middle and back rolls.

To change the draft between these two would require a change in the size of either the 20 or 21 tooth gears. This intermediate draft is spoken of as the brake draft to distinguish it from the other intermediate drafts.

TENSION DRAFT.

There is only a very slight draft occurring between certain points on machines in a mill, which serves the purpose of keeping the material tight, so there will be no undue sagging of the ends. These drafts are not enough to materially affect the total draft of the machine or the weight of the finished product. They are sometimes spoken of as tension drafts or more commonly referred to simply as tension.

(To be Continued.)

Railroads in the South have recently been very active in adopting the telephone method of handling the movement of trains. The Southern Railway has rently installed the telephone on a portion of its line, and it is reported that the equipment of the other divisions on this road will soon follow. The Chesapeake and Ohio has completed the installation of similar equipment on the Cincinnati Division, and expects to have installed within a short time equipment for handling train movements by telephone on three of its other important divisions.

The Norfolk and Western Railway has equipped a large portion of its line with telephones, and plans to cover its entire system as soon as possible. The Seaboard Air Line has installed the telephone on two of its divisions, and reports that the operation of telephones for handling train movements is so satisfactory that the extension of the service is being considered. The Atlantic Coast Line has for some time been handling train movements on one division by this method and plans to extend the service on other important divisions as soon as construction work can be completed.

THE CARE OF MACHINERY IN A COTTON YARN MILL.

DRAWING FRAMES.—FLY FRAMES.—SPINNING FRAMES.

(Contributed Exclusively to COTTON.)

H. C. W.

PART II.

DRAWING FRAMES.

The drawing process is the best straightening and evening operation in the production of carded cotton yarns. It is essential therefore that the machines should work freely and easily. The gears should not grind, and no rolls or bearings bind. The oiling should be carefully done and the gear studs, calender rolls and principal bearings oiled twice a day. The top rolls, if metallic or leather covered solid rolls running in shell bearings, should be oiled once each day. Loose boss shell rolls should be removed and oiled once every two weeks. It is usually found most convenient to do this on two frames a day and one on Saturdays.

Leather covered top rolls are usually covered with a varnish to prolong their life. It is a good practice to replace these rolls by the following method; Remove the back roll and move the three front rolls back so that the third becomes the fourth, the second the third and the front the second. Then put in a newly varnished front roll. This gives a new roll to do the most of the drawing. In moving the other rolls back they should be carefully looked over and any with loose coverings or which are uneven should be replaced with new ones. Always place new rolls towards the front.

The bottom steel rolls should be removed and scoured once every three weeks. The gears should be examined at this time and any with broken teeth replaced. In replacing the bottom rolls always see that the bearings are tight and correctly set for the staple being run. The rolls should be level and set firmly in each bearing. It very often becomes necessary to pack low bearings, and small pieces of tin are most convenient for this purpose. Unless the rolls do set firmly in their respective bearings, they are very liable to break in that joint, due to the weight being on the top rolls and to the turning of the roll itself.

Particular attention should be paid to the stop motions. These should work instantly, as any hesitation often means quite a length of light silver. If they are electric stop motions, they should be tested every morning and noon. No metallic substances such as hooks, wrenches, or oil cans should be allowed on the frames as they are liable to cause short circuits or fires. The switches should be kept clean and free from oil. A good clean contact should be provided at all connections.

If mechanical stop motions are used, care should be taken to have the spoons work freely and correctly balanced. It is always a good plan to try all frames each morning and afternoon, to test the operation of the stop motions. The calender roll and full can stop motions should be carefully adjusted. If they do not work quickly, much unnecessary waste will be made. The spoons on mechanically operated frames are balanced by means of small weights. These should be examined periodically to

see that none have dropped off. If they do drop off the spoon becomes top heavy and will not drop back and stop the frame.

FLY FRAMES.

The high speed at which modern fly frames are run requires that they shall receive careful and systematic attention. The oiling should be done by a competent man, and all oil holes should be kept clean and clear of waste. All main bearings such as the jack shaft, cones, and compound should be carefully oiled twice a day. More fires in fly frames are due to dry bearings than to all other causes put together.

The differential motions and horse-heads should receive careful attention. At the least sign of a tendency to become hot they should be removed and cleaned and well oiled. Always see that the oil holes are clear and clean. Twenty minutes spent at this is better than a stoppage of hours for a fire or breakdown.

The bottom steel drawing rolls should be removed and scoured once every six months. The top leather rolls should be oiled once a day for the solid rolls, and once every two weeks for the shell rolls. The back leather roll and front shell rolls should be replaced once every six months. The spindles and spindle steps should be examined periodically. The spindle bolsters should be oiled twice a day when convenient. The steps should be oiled once a month. Very often a frame becomes out of plumb. This causes shafts, gears, and spindles to bind.

A regular examination of the frames for worn bolsters or tight spindles will often cause a frame to run much better. The bobbin rail should be aligned periodically. Very often the spur gears on the lifting shaft become loose and allow the rail to drop a slight amount at one end. Care should be taken to see that no gear covers rub on the gears to cause fires. The gear boxes should be thoroughly cleaned of lint. One good method to pursue is to have one section of the gear boxes cleaned every week by the speeder tender. If the bobbin and spindle gear shafts and gears are kept clean, it improves the running of the machine and reduces the danger from fire.

The steel and leather rolls should be kept clean and free from lint at all times. The clearers should be picked as often as is necessary. The grade of cotton used largely influences the amount of waste made. The bobbin rail and fliers should be picked clean of waste, otherwise the draft of the fliers will draw the waste into the roving.

SPINNING FRAMES.

Modern spinning frames with a spindle speed of from 8,000 to 10,000 R. P. M. must be carefully watched and taken care of. The oiling should be done by a competent man. The spindle bearings should be kept well oiled. Dry bearings use up more power than is necessary. The banding should receive careful attention and the slack bands replaced with new ones. Care should be taken to have all bands at as nearly the same tension as possible, otherwise unequal slippage and twist will result. Insist upon the spinners making as short and even a piecing as possible.

The leather top rolls should receive constant care, and the bearings oiled regularly. The rolls should be systematically replaced. The bottom steel rolls should be kept scoured and clean. The necks of the steel rolls should be watched and kept in good repair.

For the building of well-made bobbins, the spindles should be centered and the inner edge of the pigtails kept directly over the center of the spindle. Rough rings should be discarded and travelers removed once every two or three weeks. All spinners of course desire to get as much yarn on a bobbin as possible. The taper and builder should be so regulated as to produce this result and still allow the bobbin to be removed without damaging it.

The roll beams and rail and bolsters should be kept free from lint. The leather coverings of the rolls should be of the best quality. It is the cheapest in the end. A special form of heavy oil should be used on all shell rolls. These are a few suggestions that may help towards the goal of all mill men—maximum of production with minimum of cost. They are not hard and fast rules but may be taken as an example. The conditions largely govern many points mentioned.

GROWING EGYPTIAN COTTON IN THE UNITED STATES.

Although the United States is the greatest cotton-producing country in the world, a large quantity of this staple is imported from Egypt every year. The variety of cotton most extensively grown in Egypt is known as the Mit Afifi; it has a soft, rather crinkly fiber of a characteristic light brown color that renders it especially useful for certain classes of cotton goods in which the natural color of the fiber is retained.

The best Egyptian cottons bring a price second only to that paid for the highest grades of Sea Island, being used solely in the manufacture of the finest goods. They are especially suitable for mercerizing, taking this process better than the native American cottons, and are largely used for mixing with silk and for the manufacture of cloths in which a high finish and luster are required. In 1909 the import of cotton from Egypt amounted to 72,617,893 pounds, valued at $12,101,000.

In view of the considerable value of this import, the U. S. Department of Agriculture is endeavoring to develop Egyptian cotton culture in the United States in order to supply the American market with a homegrown product. As a result of experiments that have been carried on for the past seven years in acclimatizing and breeding Egyptian cotton in the Southwest, several distinct types have originated from the stock of imported seed of the Mit Afifi variety with which the work was begun. Two of these are as distinct in the characters of the plants, bolls, and fiber as some of the newer varieties which have originated in Egypt from the Mit Afifi. A third promising type is an improved acclimatized strain of Mit Afifi rather than a new variety.

A description of the leading characteristics of these promising varieties and strains and the methods followed in the plant-breeding work, as well as a brief account of the general progress of the acclimatization experiments with Egyptian cotton during the year 1909, is given in Bulletin 200 of the Bureau of Plant Industry, entitled "Breeding New Types of Egyptian Cotton," recently issued by the U. S. Department of Agriculture.

Spinners who have examined samples of the acclimatized Egyptian fiber grown last year in the Southwest pronounce it to be in every way as well adapted to their requirements as is the imported cotton of corresponding grades.

KNITTING

AUTOMATIC SEAMLESS HOSIERY MACHINE.

HOW THE RIB TOPS ARE PLACED ON THE NEEDLES.—CHANGING THE MOTION FROM CIRCULAR TO RECIPROCATING AND VICE VERSA.—THE FORMATION OF THE HEEL AND TOE BY NARROWING AND WIDENING.

(*Contributed Exclusively to* COTTON)

BY H. K.

An automatic hosiery machine may be divided into two parts. First the head of the machine which includes the needle cylinder, cam cylinder, and other additional motions for special purposes, while underneath the table on which the head is supported is the gearing for driving the head and timing its operations. Second, the body of the machine which contains three shafts, the main or driving shaft, the quadrant shaft, and the cam or pattern shaft. The main shaft carries the loose, tight and slow speed pulleys; gear B Fig. 1 for driving the quadrant driving gear; the driving clutch pinions C and D used in changing from circular to reciprocating motion; and the bevel gear for driving the cam cylinder. The cam shaft drives from the quadrant shaft by means of a pawl and through the clutch fork G changes the head from circular to reciprocating and back to circular. On the cam shaft are placed the following parts starting from the right:

Belt shifting disk X, Fig. 2; chain sprocket H, Fig. 1; multiplying ratchet M, Fig. 1; ratchet V, Fig. 1; clutch fork cam K, Fig. 1; and the pattern drum Z, Fig. 2.

The speed of the machine is reduced when the heel and toe are being knitted and this is accomplished by the belt shifting disk changing the driving belt from the fast to the slow pulley. The size of the foot and the length of the leg of the stocking is controlled by a pattern chain carried on the pattern chain sprocket on pattern shaft, and driven by a pawl through the ratchet. The pattern chain is made up of plain links and links carrying lugs that allow the pattern drum driving pawl to operate at the proper time. In addition to these links are links having a small offset for operating the multiplying ratchet. These links are called multiplying links. By the use of these multiplying links and multiplying ratchet a very short pattern chain can be used. A plain link in the chain represents eight revolutions of the cam cylinder and one multiplying link equals 120 revolutions. All the pulleys are mounted loosely on the main shaft and the driving is accomplished through gears and a shifting clutch that slides on a key on the main shaft.

In taking up the study in detail of this type of machine, select a machine which is simple in construction and then treat each movement individually, making special mention of any mechanism peculiar to this particular machine. In any seamless hosiery machine, there are the same mechanical changes taking place, but are accomplished in many different ways by different builders.

The different movements may be classified as follows: A graduated length of loop from the top of the leg to the ankle; a longer loop to allow for an extra thread being knit in the heel and toe; the machine changed from circular to reciprocating movement; changed back from reciprocating to circular movement; and narrowing and widening operations in the heel and toe.

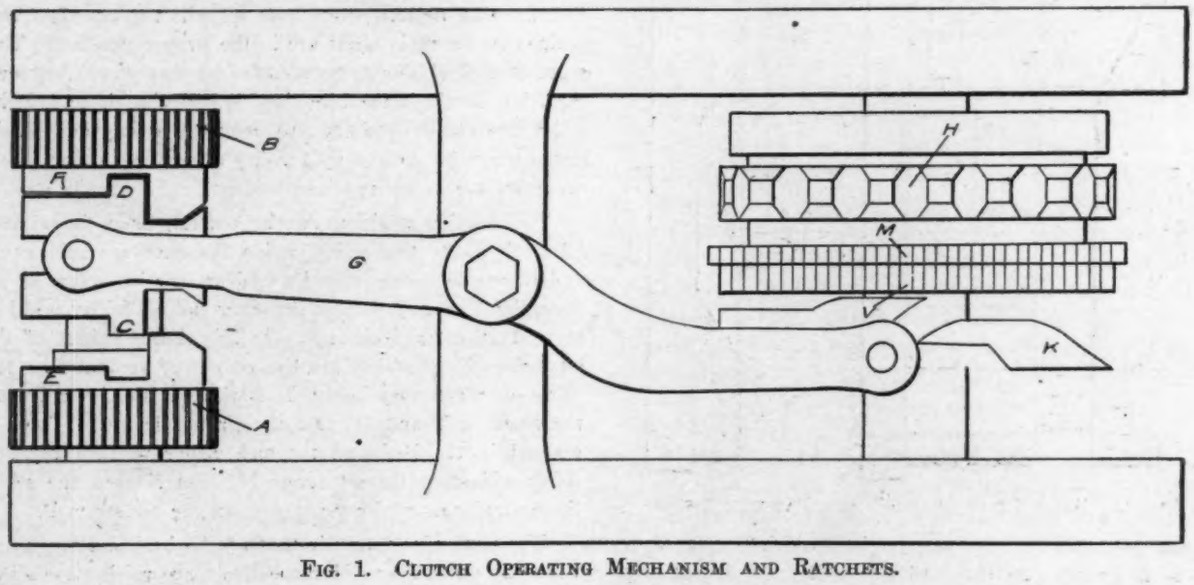


FIG. 1. CLUTCH OPERATING MECHANISM AND RATCHETS.

HOW THE LENGTH OF LOOP IS VARIED.

Three lengths of loops are employed in the manufacture of men's half hose. The tightest loops are made in the foot and ankle where the stocking requires to fit tightly. At the heel and toe a re-enforcing thread is used and makes it necessary to draw a longer loop to accommodate the extra yarn used in making that portion of the stocking and preventing it from being hard and non-elastic. At the upper part of the leg a long loop is made which is gradually tightened towards ankle, this allows the stocking to fit better.

In ladies hose the same variety of stitches are required, only the stitches in the upper part of the leg are made considerably longer than those in the foot and ankle. The adjustment of the stitch and the changes from one stitch to another is brought about in many different ways according to the style of machine used. Figs. 2 and 3 are diagrams of the stitch regulating mechanism on this particular machine which is being described. Changes in the stitch are made by the raising and lowering of the needle cylinder and sinker ring. In this machine the cylinder is held by another cylinder shown at S. This is known as the needle cylinder support and is raised or lowered by the support rod B.

In changing from a loose to a tight stitch the cylinder drops by its own weight, therefore it is necessary that it should slide freely in its bearings, and this is an aid in the transferring operation. The needle cylinder should be level so that the circle formed by the needles will be concentric with the latch ring. A cylinder out of level will

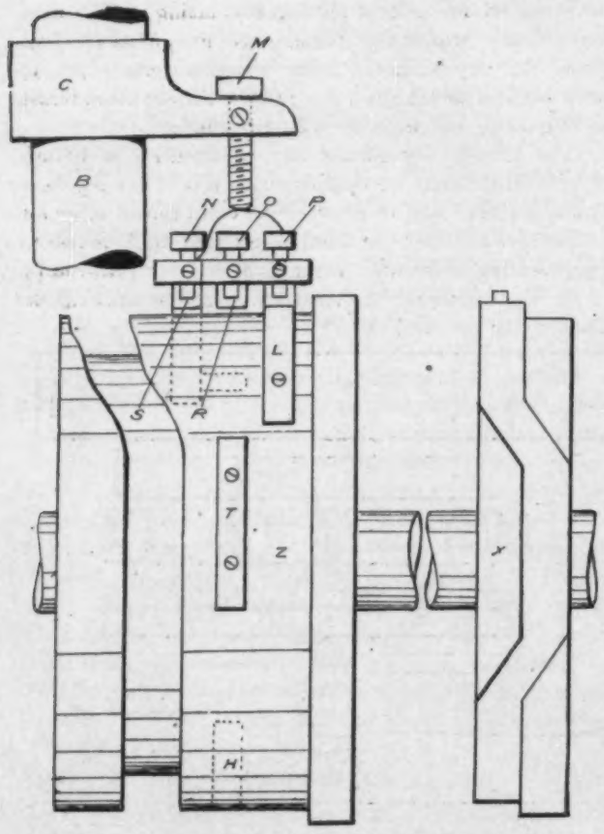


FIG. 2. BELT SHIFTING DISC AND PATTERN DRUM.

cause the machine to produce a fabric which is crooked because the needles on the high side will draw longer loops than the needles on the low side, thus making that side of the tube longer and curved. When a new cylinder or new support is being fitted into the machine this adjustment has to be tried until the machine knits a straight tube. The curve may be removed by filing off the support on the convex side of the tube which would lower that side of the cylinder and shorten the loop. The needles should be carefully examined before making a test for determining the position of the cylinder. All the needles must have the same distance of shank between the butt and the hook of the needle. It is advisable to start with new needles and not have new and worn needles mixed. Short needles will draw longer loops and the necessity of having all the needles the same length may be readily seen.

Having the cylinder in position and working satisfactorily, the adjustment of the machine is as follows:

The collar C should be set so that when the cylinder is raised for transferring, the top of the needle hooks are about 1/16 of an inch above the crown of the sinkers. Have the pattern drum in a position where none of the cams L, T, or H come under the stitch lever D; then the desired stitch in the foot and ankle is obtained by raising or lowering the support with the adjusting screw A, which forms a bearing for the rod B. This gives an adjustment of the stitch in the foot which is the smallest part of the garment and the other stitches are set in relation to this one. For the adjustment of the stitch in the heel, toe and leg, the pattern drum may be turned by hand and the stitch for these parts of the stocking can be adjusted when the

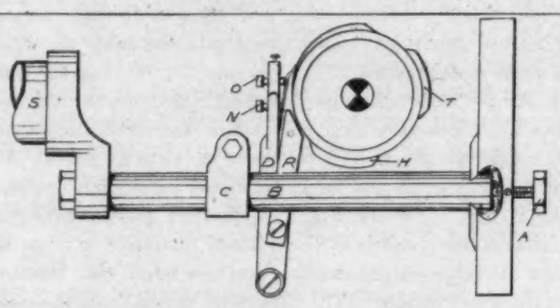


FIG. 3. STITCH REGULATING MECHANISM.

cams H, T and L are under the adjusting screws O and P, Fig. 2. The pattern drum can only be turned when the pinions on the main shaft are in the proper position. The gears A and E should be situated so that when they are revolving in the same direction, the notches E and F in which the clutch teeth fit are opposite each other. This position can be secured by turning the driving pulley until the gears are in the required position.

The starting position on the pattern drum is marked "Start." Have this point under the pressure springs S and R on the stitch lever D. Adjust the set screw M on the collar C, Fig. 2, so that the outer end of the lever D has about 1/16 of an inch play. At this time all three of the set screws N. O and P are backed out of contact with the parts on which they bear. It is through the lever D and the cams L, T and H, that the proper length of loop is secured in the heel and toe and upper part of the leg. After adjusting the set screw M, then slacken the stitch the desired amount by turning down the set screw P.

The next adjustment is that of the heel and toe, made when the cams T and H respectively are raising the stitch lever D by means of the spring and adjusting screw O. The adjustment of this stitch must be made when the re-enforcing thread is running into the stocking and depends on the size of the re-enforcing thread. The stitch should be one that will show little or no change in the fabric at the point where the re-enforcing thread begins and leaves off. A heavy re-enforcing yarn requires a long loop and this is liable to cause cut and dropped stitches where the change is made. This machine like all others is slowed down when making the heel and toe, in order to reduce the shock to the head during reciprocating.

This reduced speed is obtained by using a slow motion pulley and the reduction takes place just before beginning the heel and toe. Any machine running at slow speed will draw shorter loops than when running at high speed, even with the same adjustments. In order to prevent the machine making several courses of tight loops before commencing the heel and therefore making the instep of the stocking too tight, the lever R, Fig. 3, is used and when the rounded point of the heel cam H strikes the pin in the outer end of lever R, it raises it slightly. The adjusting screw N should be set so that the lever D is just slightly tightened, that is it has no play. This completes the adjustment of the stitch and the machine should produce a satisfactory fabric.

The actual size of the loop made is in all cases a matter of judgment of the knitter. It should be remembered that a tight stitch, while producing a firm, close mesh fabric, may be carried to such a point that the purchaser will be unable to draw the stocking on over the heel without considerable difficulty. The finer mesh, the more courses are required in the stocking, and consequently with this fine stitch, the production is reduced. On the other hand, a loose stitch, while conducive to economy in production, produces a garment that does not fit well, is loose and baggy where it should fit closely, and is greatly inferior in appearance.

Rib tops are transferred to the needles of the footer machine by what is known as a transfer quill. The top having first been transferred to the points of the quill ring, is now ready for the needles of the footer machine. The needles of the footer having been raised all to the same level, by pressing on the spring which releases the stitch cam, the machine is turned by hand. Take the needle clamp and place it over the needles to be held there by the operator while the needle cylinder is raised by means of a lever on the cylinder support rod. The clamp is necessary

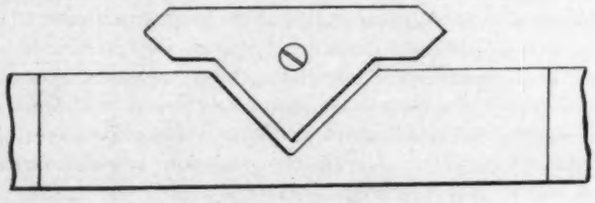


FIG. 4. STITCH CAM.

to keep the needles all at the same level. The quill ring with the rib top attached is now inserted into the needle cylinder with each point of the quill directly behind each needle. When the quill is in its proper position, the cylinder is lowered, at the same time the quill is forced down on the needles. It will be noticed that a few of the needles have dropped out of level with the others and this is at the point where the stitch cam is located. These needles are raised to take their loops by turning the machine by hand. Taking hold of the rib top from the inside of the cylinder, the transfer quill may now be removed. The yarn guide is now lowered and the machine will begin to knit as the stitch cam gets to the first of the long butted needles. Attention must be given to the yarn guide so that the first needle to knit, takes the thread. After turning the machine by hand for one revolution, to make certain of a good transfer being made, the machine can be started by power.

Rotary motion is imparted to the cam cylinder from the driving pulley through the gear B, Fig. 1, and the clutch D. At this time the gears A and the quadrant gear and the quadrant, not shown, are running idle, gear A being loose on the main shaft and free to revolve in either direction. When it is time to knit the heel and toe, the belt is shifted on to the middle pulley which gives the machine the reduced speed and just afterward the clutch C is moved over in contact with the pinions B and the cam cylinder is changed from a circular to a reciprocating motion. The middle pulley through the reducing gears drives gear B at half speed, which meshes with the stud gear on the quadrant shaft. This stud gear is driven at a corresponding reduced speed and through the crank and connecting rod drives the quadrant which in turn drives gear A on main shaft and with C in mesh with A, gives the reciprocating motion to the head of the machine. At the finish of the heel and toe, the clutch is thrown back into contact with B and circular motion begins, the quadrant, gear A and quadrant stud gear running idle.

The cam cylinder at this time is reciprocating, the large butted needles which are in the back half of the cylinder are raised out of action, but still retain their loops. The heel and toe are formed on the small butted needles. The lifters are now in operation and are situated on each side of the stitch cam. The first needle encountered by the forward lifter is raised up out of action at each reciprocating stroke. The fabric therefore becomes narrower by one needle at each reciprocation of the cam cylinder. When the desired number of needles have been narrowed which is about two-thirds of the total number of the small butted needles, the widening operation commences. Before the widening commences the pattern drum has thrown into action a cam which operates the dropper. The operation consists in the lifters raising one needle out of action and then the dropper lowering two needles into action. The widening continues until all the small butted needles are again in operation and the heel or toe completed. The long butted needles are now lowered by a special cam for the purpose and circular motion is resumed. It may be mentioned here that the re-enforcing thread is knotted on to the main thread by a knotter, just as the machine goes into the heel or toe. At the completion of the heel or toe this extra thread is cut and trapped and held ready for the next heel or toe.

While the exports of Spanish washed wool amount annually from $2,160,000 to $2,600,000, the Spanish press complains that no effort is made to increase the export, noting, at the same time, that while wool loses in weight in the process of washing it gains in value, besides leaving useful by-products.

An association of manufacturers of woolen yarns has been formed at Sabadell to increase the export of their products. The association is reported to have received every encouragement at home and abroad. The exports of Spanish yarns are chiefly to Argentina, although Argentine statistics show that out of the imports of woolen yarns into that Republic in 1908 of 854,834 pounds, valued at $303,066, only 1,485 pounds, valued at $521, were from Spain, and out of 128,768 pounds of mixed woolen yarns, valued at $23,917, only 4,180 pounds, valued at $917, were from Spain.

MERCERIZING YARNS FOR KNIT GOODS.

(*Contributed Exclusively to* COTTON.)

BY J. MERRITT MATTHEWS, PH. D.

The employment of mercerized yarns in the manufacture of knit goods has become a well established factor in the business. These yarns are now universally employed on almost all grades of knit garments for edgings and trimmings. For this purpose a bleached mercerized yarn is used, the favorite sizes being 16-2, 12-2, or 10-2. According to the quality of the garment either combed peeler, Egyptian or Sea Island yarns are required. There is a very large demand for combed peeler mercerized yarns for the lower priced garments. For fabrics of a higher quality and finer yarns, it is customary to employ Sea Island yarns for the mercerized part. In addition to its use for trimmings and edgings, mercerized yarn is now being used to quite a large extent for the making of the knit goods themselves. This is especially true in the finer grades of ladies garments. Of course, in this connection, the use of much finer yarns than those above mentioned is required, and combed Egyptian or Sea Island is generally employed.

Previous to the mercerizing process itself, the preparation of the yarn with regard to the selection of stock, combing, spinning, and twisting, is a very important factor in the manufacture of mercerized yarns. This is not only true with respect to the knitting trade, but also with respect to any use to which the yarn may be applied. In the selection of stock it is reasonable to assume that the longer the staple of the fiber, the finer its diameter, and the silkier its appearance, the higher the lustre it will acquire in the mercerizing. There are also other considerations to be met, however; for it has been shown that the amount and regularity of the twists in the fiber have considerable influence in the mercerization. Still another factor lies in the evenness of the staple; that is to say, the more regular the lengths and diameters of the fibers, the better will be the yarn for purposes of mercerization. All of these factors have to be considered in the selection of the stock, and though they are not all of the same importance, yet they must be given their equivalent values.

Egyptian cotton is perhaps, the most desirable stock to employ for mercerized yarns, when all things are taken into consideration. In Germany, this fiber is used almost exclusively for mercerized yarns; in England, however, in addition to the wide use of Egyptian cotton, there is considerable Sea Island also used for this purpose, especially for the mercerizing of higher counts. While the foreign manufacturer does not seriously consider the use of peeler cotton for purposes of mercerizing, it is far different with the American manufacturer. The latter has conclusively proved that by proper selection of stock and manipulation, a very satisfactory mercerized yarn can be obtained from peeler cotton. On account of its relative cheapness a yarn of this character has a very wide use in this country, not only in the knit goods trade, but also in many other lines of textile manufacture.

In addition to a careful selection of stock, it is also necessary to maintain the most careful supervision in the spinning and twisting of yarns intended for purposes of mercerizing. It is needless to say that the spinning should be of the very highest class, so as to produce a thread which is as even as possible in its strength, elasticity, and twist. As the mercerizing process depends so much for its ultimate success on the ability of the yarn to withstand a very considerable tension on the individual thread, it may easily be seen that the occurrence of thick and thin places in the yarn make for defective mercerizing. In order that the mercerizing be uniform, it is essential that the tension along the thread be uniform, and this can only be realized when the tensile strength of the yarn is uniform throughout its length.

Practically all the mercerized yarn employed in knit goods is twisted two-ply. There is some single yarn employed as splicing threads in hosiery manufacture which is mercerized, but this yarn is mercerized only for the purpose that it may take the dyestuff in the same degree as the yarn in the body of the goods, and is not mercerized primarily for the purpose of producing a luster so it need not be considered in this connection. It has been found that the method of reverse twisting for the two-ply yarn gives the best conditions for obtaining the highest lustered mercerized yarn. Since the luster of the yarn depends on the manner of the reflection of light from its surface, any condition that will so arrange this surface so as to increase its reflective power will, of course, make for a more lustrous mercerizing. In reverse twisting the first twist in the single yarn is somewhat lessened and the yarn is given a more "lofty" appearance. The number of turns to be put in the first and second twist of the yarn is a figure which cannot be definitely stated as so many turns per inch, as it depends in the first place on the size of the yarn, and in the second place, on the quality of the stock used. In general, it may be stated, however, that the first consideration to be met with in calculating the amount of twist is that it should be sufficient to give a yarn which is ultimately strong enough to withstand the mercerizing action; and in the second place, this twist both for the first and second, should not be made any greater than is really necessary, as too great a proportionate twist in the yarn will diminish the luster.

As for the process of mercerizing itself, there is at present no secret procedure concerning it; it is now a well known and fairly well standardized procedure. The action depends primarily upon the effect of strong solutions of caustic soda on cotton and then washing out the alkali; the treatment with the alkali and the washing with water being conducted while the yarn is under such a state of tension as to prevent it from shrinking. Caustic soda seems to possess the property of combining in some manner with the cellulose of the cotton fiber, causing it to swell up considerably, and thus naturally, if not under tension, to contract in length. If, however, it is maintained under a state of tension and the contraction which would otherwise take place prevented, then the surface becomes more or less distended and smoothed out; and the fiber which is ordinarily a flat, wrinkled, ribbon-like structure, becomes more or less rounded and cylindrical, the wrinkles on the surface are mostly eliminated with the result that it now acts as a good reflector for light, hence the increased luster.

The washing with water after the treatment with caustic soda is also an essential feature in the mercerizing, and this process must likewise be conducted while the yarn is in a state of tension. While the caustic soda at first combines with the cellulose of the fiber with the results above indi-

cated with reference to the changes in the physical appearance, it is also necessary that the cellulose again be regenerated and the caustic soda eliminated in order that the cotton be of use. If the tension is taken off the yarn before the caustic soda for the most part is removed, the fiber will shrink, and the effect desired to be obtained will be lost. By keeping it in a state of tension, however, until the caustic soda has been removed, then all tendency to shrink is lost, and the physical structure of the altered fiber so necessary for the luster is fixed in a permanent condition.

The proper strength of caustic soda solution to employ for mercerizing is a density of 55 to 60 degrees Twaddell. The solution should be kept at a temperature below 70 degrees fahrenheit to obtain the best results, as at higher temperatures the mercerizing does not take place as satisfactorily. It is not necessary, however, as once maintained by some, to keep the solution of caustic soda at a very low temperature by means of artificial refrigeration. As the solution becomes somewhat heated by reason of the chemical action of the caustic soda with the cellulose, it is necessary to cool it down somewhat, and this is readily accomplished by allowing the liquor to continually circulate through a coil of pipe surrounded by ordinarily cold water. The time required for the mercerizing action to be accomplished is very short; the only time required, in fact, seems to be that which is necessary to insure an even and thorough impregnation of the fiber with the caustic soda solution. As the yarn is generally very well "wetted-out" before it is introduced into the bath of caustic soda, and furthermore, as caustic soda solutions very readily penetrate the cotton fiber, the time of this impregnation is consequently very brief, especially as squeeze rolls are always employed in the mercerizing machine to assist in forcing the liquor into the yarn. The actual time during which the yarn is in the caustic soda solution in most mercerizing machines is about one and one-half to three minutes.

The next step in the process is the washing. This is for the purpose of breaking up the union between the cellulose of the fiber and the caustic soda so that the original cellulose may be regenerated. To accomplish this the yarn, which is still maintained in a state of tension, is passed through a bath of warm water. This water should not be very hot, not over a temperature of about 140 degrees fahrenheit. It is employed warm really for the purpose of removing more rapidly the majority of the caustic soda solution. It is not necessary to remove absolutely all of the caustic soda before the tension on the yarn is removed; it is only required that the strength of the alkali in the fiber shall be reduced below the point at which it has a chemical effect on the cellulose, and this is below 30 degrees Twaddell. The washing with water will easily accomplish this result in a very short time.

The amount of tension required on the yarn need be only sufficient to prevent any shrinkage during the mercerizing. The contractile force exerted by the yarn when treated with the mercerizing solution is very great, consequently it may be seen why it is necessary to employ such a strong yarn for purposes of mercerizing, and why the yarn should be so even in its properties.

After the majority of the caustic soda solution has been removed from the yarn by a washing with warm water, it must subsequently be treated with several washings with cold water to remove the rest of the caustic soda which is retained by the fiber with great tenacity. In fact to remove the last trace of the alkali it is necessary to give the yarn a final washing with water slightly acidulated with sulphuric acid, which is for the purpose of absolutely neutralizing the alkali. Then further washings with water must be given to remove the excess of the acid liquor, and finally a finishing process is given with some suitable softener for the purpose of relieving the harshness of the yarn which is acquired in these several treatments.

As to the mechanical manipulation of the yarn in mercerizing, there are two general types of machines in use, namely, the warp and the skein machine. In this country the warp method of mercerizing is almost exclusively employed, there being but a very small amount of skein mercerizing done. In Europe, on the other hand, there is very little warp mercerizing done; in Germany, France and Switzerland, practically all of the yarn mercerizing is done on skein machines; in England, while most of the yarn is also mercerized in this manner, there is a small amount of warp mercerizing done on yarn which is to be employed for weaving warps. In this country there seems to be a prejudice against the use of the skein method, it being claimed that the warp mercerizing gives more even results and is more economical. This is true without doubt where a large production is to be considered; as the warp process, being a continuous process from the start to the finish of the operations, allows of great economy of labor and manipulation. And also owing to the form in which the yarn is handled there is probably less danger of unevenness resulting.

The skein method, however, when properly operated and with a proper machine, can be made to give perfectly even mercerizing. There is probably no better grade of mercerized yarn turned out than that employed so largely in Germany for the manufacture of fine mercerized hosiery and other forms of knit goods, and all of this yarn is mercerized on skein machines. Where a comparatively small production only is desired the skein method may be used to a great advantage. In any knit goods mill where from 20,000 to 50,000 lbs. of mercerized yarn is used per year, it would be a paying investment to install a proper skein mercerizing plant, as the cost of mercerizing, under even the most adverse circumstances would not be more than four cents per pound of yarn. This is especially true where such a mill is already engaged in bleaching, under which conditions, in most cases the cost of mercerizing should not reach more than three cents per pound.

AMERICAN VESSEL AT BUENOS AIRES.

(From Robert Woods Bliss, charge d'affaires, American legation.)

On December 7, 1910, there arrived at Buenos Aires the steamship Texan, the first steam vessel under the United States flag to enter this port in 20 years. The newspapers have commented favorably on the presence here of a large steamer flying the American flag, and call attention to its having made the trip from New York to Montevideo in 20 days. It was chartered by Barber & Co., of New York, to carry a general cargo to Montevideo (2,000 tons), La Plata (2,000 tons), and Buenos Aires (14,000 tons), and if possible to bring back a cargo.

Congress has passed a bill authorizing the construction of a wireless telegraph station at Colon.

DYEING, BLEACHING AND FINISHING.

THE HARMONY AND CONTRAST OF COLORS.

RULES FOR HARMONIOUS COMBINATIONS OF COLORS, COLOR PAIRS AND TRIADS, PREDOMINANCE OF WARM HUES, QUALITIES OF COLOR.

BY DAVID PATERSON, F. R. S. E., F. C. S.

PART IV.

HARMONIOUS COMBINATIONS.

In the foregoing chapters, the subject of complimentary colors has been fully discussed, because it forms the most important part of the study of color harmony. It has already been pointed out that the strong complementary hues require, in most of cases, to be saddened down into "broken tints," or shades, or reduced with white into tints before they can be safely introduced into the majority of textiles. In their pure state the combinations are too vivid; and inclined to be harsh and strong to the cultivated eye. For example; although red and blue-green; blue and yellow; green and purple; or yellow-green and violet are scientifically correct as complementaries, they do not give

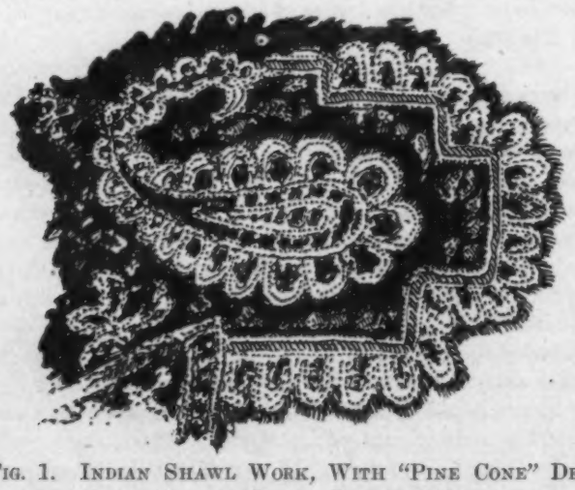


FIG. 1. INDIAN SHAWL WORK, WITH "PINE CONE" DESIGN IN YELLOW, BLACK, RED AND GREEN.

restful combinations. They require toning down, so that the visual nerves do not become so readily fatigued by excessive stimulation. To the uneducated eye, or to savage tribes, bright colors and glaring contrasts are pleasing; but the eye and mind, educated to the appreciation of the finer and more subtle beauties of colors, prefer the subdued harmonies of the dulled hues.

Great care is required in the handling of bright strong colors, and when they are used at all in fabrics, they are used only in exceedingly small pieces, and properly balanced with some other color in harmony with them. Before me as I write is a piece of beautiful woven silk texture copied carefully from an Indian shawl. the design is largely floral, with geometrical figures here and there, and throughout the whole pattern are varied forms of the well known "pine-cone" design, see Fig. 1. The colors are red and dark green; orange-yellow and black. Here we have strong contrasts of color, which, in a large pattern like a carpet, would undoubtedly prove harsh and disagreeable. Yet in this Indian's shawl work the whole effect is pleasant, harmonious and subdued. The reason for this is that the design and the colors are very minute, infinitely broken up and equalized, so that the whole effect is indescribably rich and pleasing to the eye. If held a little distance away the total color effect resembles a rich golden bronze appearance. Much the same beauty of color is observed in Oriental rugs.

A most useful method of arranging complementary colors is by means of the color circle already mentioned in an earlier chapter. Round the circumference of the circle are placed the various normal hues: red; orange; yellow; green; blue; violet; and it will be observed that if a line be drawn from one color on the circumference, through the center, it reaches its complementary color exactly opposite. In other words, one color is separated as far as possible from its harmonising complementary, i. e., 180 degrees. Thus we find red at one end and green-blue at the other. Orrange opposite to blue-green-blue. Yellow-green opposite to violet and so on; so that the exact complementary of any hue can at once be deterimned by consulting its opposite on the chromatic circle. See Fig. 2. In order to

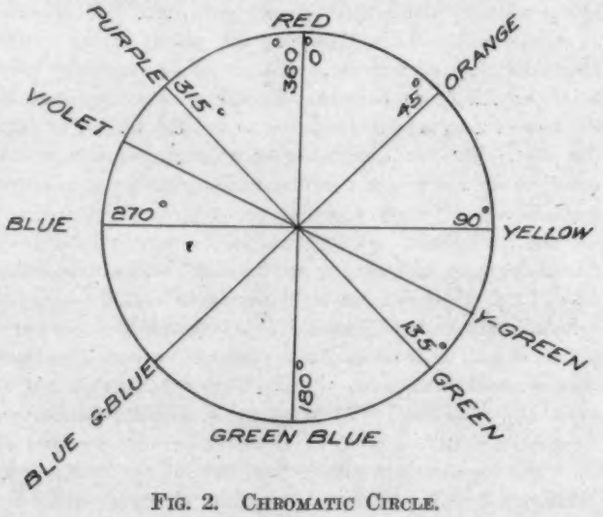


FIG. 2. CHROMATIC CIRCLE.

make harmonious combinations we need not always select colors removed exactly 180 degrees from each other. Indeed, some of the best color authorities are agreed that hues selected about from 20 degrees to 30 degrees on either side of their direct complimentaries, make more agreeable color combinations; and not being so excessively in contrast with each other, are more easily manipulated in color schemes. For example: red and blue; yellow and violet, or purple; or orange-yellow and blue-violet give perfectly pleasant combinations. They show quite sufficient contrast of hue and are not so strong and harsh as when precisely complementary to each other.

A RULE TO REMEMBER.

In bringing two colors together to form a harmonious color scheme, it is always a good rule to remember that if the two colors selected are less than 90 degrees separated

from each other on the chromatic circle, then the result will be poor and ineffectual. In many cases they will spoil each other. This may be seen in combinations with scarlet and orange-yellow; blue and sea-green; violet and magenta; green and turquoise; all these are decidedly poor pairs. If, on the other hand, the color selected be removed from each other from 90 degrees to 200 degrees the result will be quite satisfactory. This I have illustrated in a very simple manner in Figs. 3 and 4.

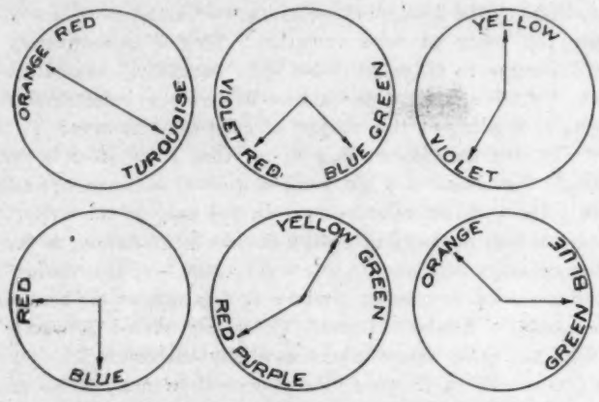


FIG. 3. GOOD COLOR PAIRS, SHOWING THE DISTANCES APART FROM EACH OTHER ON THE COLOR CIRCLE.

COLOR PAIRS.

For the guidance of my readers I have drawn up three lists of a few pairs showing good, fair and bad results, if placed side by side. It would be excellent practice to study these on the chromatic circle as shown on Fig. 2,—or better still, on a much larger one drawn out on pasteboard,—and trace for oneself the why and the wherefore of one combination being good and another being bad. The habit of thinking for oneself and working out the results is worth any number of lists drawn up by this or that authority.

GOOD.

Red and blue.
Red and blue-green, (harsh).
Orange, red and blue.
Orange-red and turquoise.
Yellow and blue.
Yellow and violet.
Yellow-green and violet.
Yellow-green and red-purple.
Green and plum.
Blue-green and violet.
Crimson and slate-blue.

FAIR.

Red and yellow-green.
Red and green, (strong).
Orange-red and green-yellow.
Orange-red and violet.
Yellow and blue-green.
Yellow and turquoise.
Yellow-green and purple.
Green and purple.
Blue-green and purple.

POOR.

Red and violet.
Red and yellow.
Orange-red and purple.
Orange-red and magenta.
Yellow and red.
Yellow and green.
Yellow-green and blue-green.
Yellow-green and green.
Green and turquoise.
Blue-green and yellow-green.

If grey, white or black be added to these normal hues, we get a long variety of useful mode shades and tints, which are of great service to the colorist. For example the following pairs I have experimented with and find them excellent:

MODE SHADES.

Claret and light slate-blue.
Maroon and dark slate.
Chocolate and blue-slate.
Citrine and plum.
Plum and seal-brown.
Old gold and blue-sage.
Moss green and dull purple.
Myrtle and dull crimson.
Dull violets and yell w-greens.

TINTS.

Pink and pale azure.
Strawberry and robins egg blue.
Salmon and apple-green.
Amber and heliotrope.
Canary and lavender.
Violet and amber.
Straw and amethyst.
Lavender and ecru.
Pale pea-green and heliotrope.

COLOR TRIADS.

It is a comparatively easy matter to select a harmonious pair or dyad of colors, but, it becomes a little more difficult when three or more colors have to be combined harmoniously in a color scheme. But, if the introduction of a third color often spoils a good pair, it has the compensating advantage of often improving a bad pair. Suppose we bring together red and a yellowish green; they form quite a pleasant pair, but if we add orange to the group we make a poor

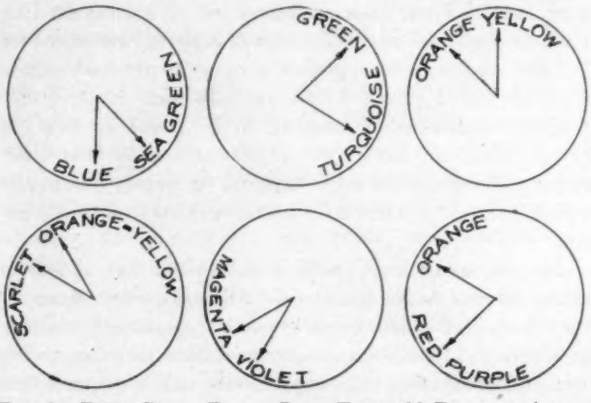


FIG. 4. POOR COLOR PAIRS, LESS THAN 90 DEGREES APART.

triad. Blue or violet would make a better combination. Then again, green and blue are an unpleasant pair, but if we add red or orange, the pair seems improved and there is formed quite a passable triad. In bringing together the colors it is advisable to have them about 90 degrees to 120 degrees separate from each other on the chromatic circle: and it is well to remember that two of the colors should be what are termed "warm colors," that is they should belong to the red, orange and yellow class rather than to the blue and violet. In order to attain this predominance of a warm hue, a pair has often to be selected less than 90 degrees separate from each other. Bearing this rule in mind the student can readily select for himself harmonious triads. For his guidance I here give a selection I have made of a few good color triads and also groups selected by Professor Church and Mr. Ward, the well-known authorities on color harmony.

GOOD TRIADS.

Carmine red, prussian blue and yellow.
Purple, dull green and orange -yellow.
Ultramarine, green-yellow and orange-red.
Violet, orang and yellow-green.
Crimson, turquoise and orange-yellow.
Brown, slate and olive.
Terra-cotta, moss-green and plum.
Old gold, claret and green-slate.
Citrine, blue-slate and maroon.
Salmon, lavender and pale yellow-green.
Amber, pea-green and heliotrope.
Ecru, pale turquoise and pink.
Pale blue, buff-pink and salmon.

SELECTED BY PROFESSOR CHURCH.

Purple-red, yellow and greenish-blue.
Orange, normal green and violet.
Amber, cream and medium blue.
Normal red, gold and normal blue.
Leaf-green, puce (deep) and rose-grey.
Leaf-green, violet and salmon.
Yellow, violet and yellowish-green.
Normal green, orange and turquoise.
Maroon, bronze-yellow and olive-green (dark).
Apricot, crimson and gold-brown (pale).

SELECTED BY MR. WARD.

Coral-red, ultramarine and orange-amber.
Leaf-green, pale orange and pale pink.
Indigo, orange-red and greenish-yellow.
Venetian-red, chamois (deep) and sea-green.
Lavender, dull orange and yellowish green.
Purple, yellow and grey-green.
Scarlet, olive-green and violet-blue.
Ruby-red, deep blue and greenish-gold.
Violet, orange-yellow and green.
Grey-blue, amber and greenish-gold.

I have already stated, that in order to obtain pleasing harmony where a variety of colors are used, there must be a

predominating hue and that hue must belong to the warm class. Cold colors like blues, greens and violets are difficult to manage successfully in color schemes. They give cold and as a rule, unpleasant results; except under certain special circumstances where a *cool scheme of coloring is aimed at.* Color has a wonderful mental effect, and for some psychological reason not easily explained, we prefer a warm tinge over our color combinations. We naturally like to see things in a sunny and warm coloring, as when we view the landscape or a picture through a piece of yellow or orange tinted glass. I have recently been carefully examining the scheme of coloring to be found in fine old oriental rugs and have come to the conclusion that their beauty and richness of color harmony is largely due to the predominance of a warm coloring throughout their whole design.

Age, as we all know, adds a rich mellowness of hue to textiles as well as to paintings. All good color effects in every brand of tinctorial art whether paintings, textiles, mosaic-stained glass, or enamels, must have this dominating hue; otherwise the coloring becomes aimless, uncertain and is sure to produce an unsatisfactory result in the eye of the observer. Professor Church has made the suggestion that probably the reason why we prefer a warm hue is because such colors do not so readily exhaust the eye nerves as do the green-blue and violet. Probably the association in our minds of comfort and warmth with warm hues, plays no small part in this preference for "warm" colors.

It has often been argued that perfect color harmony or balance is reached when all the colors of the object, let it be a picture or a textile, if mingled together on the retina go to produce a neutral grey tint. In other words, that beauty of harmony must possess all the constituents of a dull greyness. This is a faulty idea. The eye and mind crave for something more than absolute neutrality. We tire of this delicately adjusted greyness and want something positive. Any work of art, based on this principle of harmony, would be uninteresting from the chromatic point of view. No one color has any predominance over the other and the result is accordingly more or less unpleasant. There is no "key" to the coloring, no dominating color scheme and the result is that the various colors brought together seem to be struggling for the mastery. One color should predominate to give a pleasing effect to the eye in the same way that one tower of a large building should stand out higher than any of the others. The beauty and symmetry of many objects in nature and in art depend upon this same principle of a dominating member.

QUALITIES OF GOOD COLOR.

One of the most precious qualities of good color is its gradation; its power of showing infinite variation of hue and tone. If we examine carefully any one single color object of nature, we will see the wonderful variety of tones of color it possesses. It is this infantile gradation in natural objects that makes the color of nature so charming to us. An ordinary green leaf from any tree, or a broad expanse of grass, present to the observant eye many different tones of green. The sky, whether it be a dull grey or sunny blue; the ploughed field; the sea; the meadow or the waving corn field; are all throbbing with infinite gradations of color tones. To some folk, the ploughed field may appear simply one tone of an earth-brown color and nothing more; but I had the curiosity lately to stand and count the different tones of color in a few feet of ploughed furrow, and could count distinctly nine or ten; while there were many others so infinitely fine in gradation that they were too subtle to distinguish separately; and all these indescribable color tones were repeated over and over again with every furrow of the field.

It is this infinitely gradated quality that makes color so attractive to us. We see this quality too on the surface of dyed textiles, in enamels, in color glazed earthenware, etc., where the little irregularities of surface and transparency give full scope to color variation. This adds a mystery and a value to all color. "No color harmony," says Ruskin, "is of a high order unless it involves indescribable tints." Writing on this subject of good color he says:

"It is a marvelous thing to me that book after book, should appear on this last subject, (color), without apparently the slightest consciousness on the part of the writers that the first necessity of beauty in color is gradation, as the first necessity of beauty in line is curvature,—or that the second necessity in color is mystery or subtlety, as the second necessity in line is softness. Color ungradated is wholly valueless; color unmysterious is wholly barbarous."

"The skill with which the thirteenth century illuminators in books, and the Indians in shawls and carpets, use the minutest atoms of color to gradate other colors, and compose the eye, is the first secret in their gift of splendor, associated, however, with so many artifices which are quite instinctive and unteachable, that it is of little use to dwell upon them." He then gives his five laws "to which there is no exception whatever," regarding good color. They are:

(1) "All good color is gradated.

(2) All harmonies of color depend for their vitality on the action and helpful operation of every particle of color they contain.

(3) The final particles of color necessary to the completeness of a color harmony are always infinitely small.

(4) No color harmony is of a high order unless it involves indescribable tints. (Even among simple hues the most valuable are those which cannot be defined; the most precious purples will look brown beside pure purple, and purple beside pure brown; the most precious greens will be called blue if seen beside pure green, and green if seen beside pure blue.)

(5) The finer the eye for color, the less it will require to gratify it intensely. (But that little must be supremely good and pure, as the finest notes of a great singer, which are so near to silence. And a great colorist will make even the absence of color lovely, as the fading of the perfect voice makes silence sacred.)"*

COLORS OF ORIENTAL RUGS.

If we carefully examine the beautiful color harmonies in some of the famous old oriental rugs and carpets we will be struck with the simplicity of the color schemes. Some of the finest examples have but few colors, but these are rich and subdued and in fine harmony with each other. As a master painter can produce an exquisite piece of art with a very limited palette, so these master craftsmen of the East have produced their textiles with a rich simplicity and beauty of color and design that make them not only charming to look at, but are a wonder to us at the present day.

It is a great mistake to think, as many people do—

*"The Two Paths," by John Ruskin, Appendix V.

that beauty of color means profusion of color. Some of these masterpieces of textile art have no more than half a dozen colors altogether.

I shall give here very briefly and in barest outline a few of the color harmonies in some of the most famous examples of oriental rugs.*

(a) An old Turkish prayer rug.

The ground in this is a rich crimson, with a broad border of olive green. Here is a simple and beautiful pair of colors only. The floral work is of green, orange, and turquoise, with drab colored scrolls.

(b) An old Herat rug. (Afghanistan.)

The ground of this is a dark slate blue, broken up with figures in a dull red, green-blue and drab. The whole is outlined with a tawny yellow. The colors here are very simple, and the outlining with the dull yellow gives the whole design a warm sunny tone throughout. Here we see the value of the rule for the dominance of a warm hue.

(c) An old Herat carpet.

This is another example of a superbly rich result obtained with few colors. The ground is crimson. There are figures on the ground of light indigo blue and dark indigo blue, old gold and green and a dark brown. To balance the ground of crimson is a wide border of dark myrtle or pine green; (a beautiful pair of colors), and on this dull bluish green border are figures in a russet brown. Very simple color combinations, yet the harmony of coloring is beautiful.

(d) Old 15th century Oriental rug.

This is a magnificent piece of work, with a quiet rich beauty of harmony about it, and it contains only two colors. The ground is a deep crimson, and on it are intricate designs all over of a dull green. Here we have a masterpiece on textile coloring with simply two colors, a broken red and a broken green.

(e) Old Smyrna rug.

In this rug the ground consists of crimson and slate blue in panels. On the crimson panels are blue-green and yellowish bluff geometrical figures; while on the blue panels are designs in red, green and yellow buff. Running throughout the whole pattern are broad decorative ribbons of dark indigo blue, with yellow buff creepers on them. (Yellow ribbons or creepers, on a dark blue ground is a coloring peculiar to Anatolian prayer rugs.)

As this last is a typical example of what I wish to show, let us examine these color combinations carefully. Crimson and slate blue are the two principal colors in panels. These two colors we find in the list of good pairs or dyads already given. On the crimson panels are a bluish green and a yellow. These again form a good triad, and will be found the fifth on the list given. Likewise on the blue panels are red, green and yellow, which form an excellent four color or totrad combination. Then lastly the yellow buff designs on the indigo blue ground form complementary hues already given in the list of good pairs.

I might give many other examples but the above will suffice to show that the grandest color combinations are based on the simple laws that we have been studying. I have recommended before, and will do so again, as a valuable aid to the colorist, the practice of mentally analysing in a broad simple way, as I have done, these oriental textiles, all finely colored objects of art, and noting the facts down in a note book. Our museums, and treasures of art afford every opportunity for the study of color. The cultivation of such a habit of mind well repays the little time and willpower it takes by giving greatly increased knowledge, keener power of observation and of thought.

*See the finely colored plates in "Oriental Carpets" published by the Royal Austrian Museum, 1892.

ALUMINA SOAPALITE.

Alumina Soapalite derives its name from the fact that it is very similar to soap and will unite with soap in any proportion. It is not simply a mechanical mixture, but it is a new chemical compound and is made by combining the oxide of the metal aluminum with other minerals in such a manner that the resulting compound combines chemically with caustic soda. It is detergent in powdered form for use in textile mills laundries, and other establishments where washing is carried on.

Alumina Soapalite is claimed to double the cleansing energy of the best soap, owing to the fact that fat soap gives up, when dissolved in water, either acid or alkaline salts, and it is the alkali of the alkaline salt that does the cleansing. This alkali in the presence of greasy dirt combines with fatty or vegetable substances and becomes an inert salt when saturated with such matter. The above action is also true of Soapalite.

Soapalite holds the caustic in combination with aluminum and other minerals until it actually comes in contact with the grease, and this enables the bleacher to put what is equivalent to a larger amount of caustic in the soapalite without running any risk of its attacking the fabric under operation, and yet obtaining the benefits that would otherwise come from the use of free caustic. The precipitant produced by the action of Soapalite on the grease is a harmless white powder.

The amount of water in Soapalite is about 35 per cent., but it is claimed that this large amount does not interfere with its carrying more than double the caustic that a neutral soap carries, and when this additional caustic combines with the grease in the material under operation this forms soap which has the cleansing energy of a neutral soap. It is necessary for the water to be present in the compound in order to leave it in an easily soluble condition and to contribute to the mechanical simplicity of its manufacture.

It is claimed that Alumina Soapalite will not injure the most delicate fabrics, no matter whether that material be silk, wool, cotton or linen, white or colored. It can be used alone and with soap in any proportions to displace soda, borax or potash, the detergent power being greater, it is claimed, than either and its use safer than potash. It is claimed to be economical, safe and harmless, used either alone or with soap. The action of Soapalite is said to be something new, much quicker and more penetrating than the ordinary action of soap, and it would seem that its use would thus tend to shorten the time of washing. When used for washing woolens, it imparts a soft and fluffy feel and leaves the goods with a sweet and clean smell. It is claimed that colored goods when washed with soapalite will not be faded, but will grow brighter with repeated washing.

In the consumption of cotton in the United States, the state of Massachusetts ranks first, North Carolina second, South Carolina third, Georgia fourth, New Hampshire fifth, Alabama sixth, and Rhode Island seventh.

Practical Problems Discussed by Cotton's Readers.

We invite our readers to make use of this department for the discussion of any and all problems arising in the mill or the finishing plant. Questions, answers or letters need not conform to any particular style and will be properly edited before publishing. The editors do not hold themselves responsible for any statements of opinion or fact which may appear in this department unless so indorsed. This department is open to all.

A CRITICISM OF THE RAILWAY HEAD.

BY F. W. G.

In your issue of January 1911 is an article on the "Use of Railway Heads" by W. F. H., which was of great interest to me. I have been making tests along the same lines and I trust W. F. H. will pardon me if I do not agree with him in every detail. His article sounds as if it was written by one connected with a machine shop instead of by a carder and if such is the case he has every reason for advancing all the good points about a railway head which his article certainly does.

A railway head is built in two parts which should work in connection with each other. I believe that is the point that is emphasized in regard to the evening quality of the head. In my opinion the head does not do this even though it may appear to do so. For example,—light sliver passes through the back rolls. Has anything been done to even it? The sliver passes on through the front rolls and still no evener motion has been effected. It reaches the trumpet and after some of the light sliver has been drawn through, the trumpet raises and in about three seconds more the cone belt moves and the back roll is speeded up. By this time several coils of sliver have been run into the can and in all probability the light streak has gone through.

What effect did the speeding up of the back roll have on the sliver already in the can? None whatever. And now comes the point where the head works wrong. The light streak having gone through and the evener motion working the cone belt toward the heavy side, speeds up the back roll and makes the sliver that is passing through heavy. In all probability the sliver that the evener motion affected was all right and should have been left alone. Instead, it is made heavier and when this heavy sliver reaches the trumpet the head simply swings the other way and lightens up on sliver that may already be too light.

The railway head is an excuse, built by machine companies who are bright enough to see the mistake that mills are making. It took us some time to find it out but I am firmly convinced that the head is not a necessary evil. The solution of the whole trouble is the picker room. I have had a man size the drawings and heads four times a day for two months and results were not satisfactory. I kept behind the boss picker man about the laps that should go back. I watched the pickers myself whenever I had time, but still uneven work was the result. I took the man doing the sizing on drawings and heads and had him weigh every lap that was finished. In three days the drawing sizing settled to nearly a perfect size and since then we have not changed a draft gear from the drawings up to the jacks on 18.00 roving.

In the mill in which W. F. H. made his tests and found the drawing sliver varying 15 grains in three yards something must be wrong. Possibly the finisher pickers are in charge of a man who cannot be depended upon and does not set back the laps that are off weight. In my experience I have never found a man who had to run the finishers that could be depended upon. I trust that my few suggestions may be of help to some one who is not satisfied with his drawing size.

A REQUEST FOR DETAILS.

BY MAXIMUS.

I have read with a great deal of interest the article by H. R. Carter which appeared on page 155 of the February issue of COTTON. There is only one radical fault to be found in Mr. Carter's article and that is that it is too general in its scope and does not give enough attention to details. What we men in the finishing plant really desire is something that will take up the fine details of a process giving all the necessary ingredients, twaddle readings, temperatures, methods of mixing and methods of applying same to the goods in process.

Any one who has ever worked in a finishing plant knows that a certain piece of goods is run through a starch mangle, but there are very few who know what is put into the starch mangle to secure the necessary finish, or the proportions of the various materials used. If Mr. Carter, or some other contributor to your columns would take a certain process and carry a piece of goods through that process, giving all the details, from the time the cloth started in the process until it came out as finished goods, it would no doubt prove intensely interesting not only to me, but to other readers of your columns. The same might be said of articles describing operations in bleaching, dyeing, and printing, as well as in the finishing room.

On page 162, your correspondent, M. T. S., in his letter giving hints for the bleacher, says that any stains in the cloth would be taken out in the process of boiling and bleaching. It is a question in my mind whether the rust stains which were under discussions would be taken out in the boiling and bleaching process. I would like to hear the experience of some other contributors along this line and I would also like to have M. T. S. write and tell us how he would take out rust stains if they were found in the cloth after the bleaching operation was finished.

He also makes the statement that the color sometimes changes on dyed goods owing to a fault in the bleaching, but he does not say what that fault is, nor how it should be rectified. This writer also seems to be having trouble with spotted goods in dyeing, caused by some of the yarns being of harder twist than others in the same piece of goods. It would be interesting to hear from other dyers along this

line and also a letter or two from some of our cotton mill friends as to what could cause this variation in twist. I would like to inquire if any of your other readers are troubled with light green spots appearing on aniline black goods, caused by condensation on the delivery end of the ager and if so, what they do to prevent same.

THE RELATION OF THE DRESSING ROOM TO WEAVING.

BY R. W. B.

When the cotton has passed through the various processes and reaches the dressing room it is usually on the spinners bobbins as warp yarn and the dressing department spools, warps, slashes, draws in, and delivers it to the weave room. There is no department in the mill that can do more damage to the yarn or create more trouble for the weaver in handling than the dressing room.

In the process of spooling a girl ties about 4,000 knots daily on say 29s warp yarn, and in a mill of 1,000 looms about 24 spooler tenders are employed, so that about 96,000 knots are put into the work by the spoolers every day with their knot tying machines. Very often half of these knots and sometimes more will have kinks in where the knot has been tied, simply because the spooler did not handle the thread and cause it to run on the spool under tension after the knot was tied. These kinks will not come out either at the warper or at the slasher, but go to the weaver and cause all kinds of trouble.

If warp stop motions are used the kinks will slacken under the action of the reed and harness without breaking and allow the drop wires to drop and stop the loom. In such cases the weaver very often has difficulty in locating the slack end, thus causing a loss of product. On the loom where a warp stop motion is not used, the kinks will often break the threads on each side of it, and a pick-out is the result which again causes loss of product and makes imperfect cloth.

Spooler tenders should be so trained that it becomes a natural movement for them to hold back the threads after tying and so avoid these kinks. This process needs the careful attention of the overseer, as very often a spooler tender may adopt some method of her own when tying the knots and be making an excessive number of kinks. A good idea of the amount of these imperfections may be found by watching the front of the warpers. A good spooler tender will very rarely allow a kink to go past, but a poor one will be so careless when not under the scrutiny of the overseer that she will make a kink with nearly every knot. There are many other faults to be found in spooling, such as mixed yarn, poorly built spools, or spools run too full, or thread guides not adjusted for the yarn being spooled and allowing lumps and bunches to pass into the work, but while they are serious matters to the success of a mill, they do not effect the product and quality of the weave room as the kinks do.

As we pass along to the next process and start warping, it is necessary to see that great care is taken in making the warps for the slasher. The warper tenders are sometimes careless when a thread breaks and do not get the threads straight on the beam before tying up; and when these come up on the slasher they are crossed under other threads and break. Then they usually run a few hundred yards before the slasher tender discovers it; and when the warps get to the weaver there are one or more threads missing for a few cuts. This must be made good by the weaver who crosses a thread over from the selvage or puts in a small spool to make good the deficiency, so that the cloth may be free from an imperfection. If the warper is not very careful in her work, there will be many of these crossed threads to make trouble for the weaver.

Another point for the warper to watch for the benefit of the weavers is the knots. These should be tied and broken off close and held, until the slack is taken up to avoid a kink. She should also see that the ends broken off after tying are not allowed to get rolled in with the warp as this loose waste yarn is always giving trouble either in the slasher comb or if the waste passes this it will certainly appear behind the drop wires or back of the harness at the loom. Great care should be taken to have the flanges on warper beams running perfectly true, as no good beams can be made where the flanges and beams are not taken care of. Many bad selvages are caused from this trouble and the weaver has to remedy the same as best she can, making waste and a slovenly looking warp.

Good hard level beams are desired for good running during the process of slashing. The dressing or sizing of the yarn is of the greatest importance to any mill, no matter what grade of goods are made, but especially so when the goods are high sley or pick. No one but a competent, reliable man should be allowed to run a slasher. Usually three of these machines can supply warps for 1,000 looms on medium numbers, so that it can be readily seen that any incompetent slasher tender can cause months of trouble in the weave room in a few hours. We know that imperfect work caused in the spooling or warping can not be remedied here; but a good slasher by watching the warper beams can straighten out many of the crossed threads before they break and so save himself the trouble of cutting the lap later. This also helps in the weave room to a very great extent.

But the important thing to watch is the size. After experimenting and being satisfied that you have the best mixture for your particular work, put a careful man in charge of making it and watch it for any variation, as sometimes the starch and other ingredients used are not of the same quality and by having one man attending to this matter all the time he becomes expert in judging when his mixture is just right. I do not wish to go into the matter of the qualities of the various starches, gums, or any of the various sizing compounds as it is a broad subject and mill men are always ready for argument on it; one man will claim great results from a certain formula and another will stand by his particular mixture. The main point is to study what gives the best results in your own mill, making tests occasionally and watching results in the weaving.

The taping of warps while running in the slasher is of great benefit to the weaver and should be done on every warp if any breakage occurs, otherwise the weaver is handicapped with a number of threads taped together and constantly breaking or as is very often the case the weaver finds it necessary to cut out the threads so taped or sized together and put others in their place either from the near selvage or by small spools.

The tension at which the yarn is run on the slasher is also of vital importance to the weaver, and if run tight the elasticity that was in the yarn is gone and a harsh,

hard, snappy thread is the result which makes it impossible for the weaver to get either the per cent. of product or quality. The yarn must at all times be as free from stretch as the running of the work will allow, and you will then have the necessary elasticity in the yarn which is so very essential to good weaving.

I have endeavored to show how the various processes of spooling, warping, and slashing effect the production and quality of the weaving and that the main success of a weave room is in proportion to the efficiency of the dressing department.

AN EXPERT'S STUDY OF THE CARD.

BY M. S.

The modern revolving flat card is constructed so as to secure the largest possible percentage of production. To attain this end the manufacturers have found that 165 revolutions a minute of a 50¾ inch cylinder (including clothing) is the proper limit, which is about 2,200 feet velocity a minute. This limit is set on account of the centrifugal action on the cotton fiber. The speed of the doffer determines the amount of cotton that is carded when the draft is not changed, and it should not exceed a velocity of 90 feet a minute. But it must be acknowledged that the speeds of the cylinder and doffer are overdone in many mills.

When new cards are to be clothed, the quality of yarn to be run should be considered. For coarse work, the twilled fillet is preferable on account of the stronger edges, which gives a better foundation for the wire. However, for medium and fine work, the cylinder and doffer are usually covered with rib-set fillet. Plough ground wire is to be preferred on account of its sharp sides, as the points have a better opportunity of holding the fibers until they are straightened. Wire which is not plough ground will allow the fibers to escape before they are properly combed.

No special time can be set for grinding as that must always be controlled by sight, ear and touch. If the grinding is done lightly and carefully, the top edges of the wire will be formed something like the cutting edge of a carpenter's chisel, but on account of lateral motion of the grinder, the side edges will be ground off, leaving nothing but the sharp point. On the other hand, if the grinding be too heavy, the pressure from the emery wheel will cause the points of the wire to blister, forming what is termed a hook. The wire in this condition is detrimental to good carding, because it prevents the cards from being stripped clean, owing to the fibers clinging to the wire, and thus increasing the amount of waste.

Grind slowly, lightly, and carefully, with due regard to the quality and temper of the wire. There is no position in a cotton mill that demands so much care as that of grinder. The mills that pay good wages to their grinders find it the most economical way in the end. A good grinder will save a lot of unnecessary waste of good fibers by having his cards set properly.

Allowing the card room to get too cold will cause lapping on the doffer, instead of it being stripped off by the comb. Lowering the comb will help to overcome this trouble. When the cotton is sagging, the comb should be raised and set carefully to a No. 8 gauge. If the web still sags, it indicates that the web is too heavy. For a print cloth mill, the weight of the card sliver should not exceed 52 grains per yard. Many overseers believe in running a heavy sliver on a card; because they have an abundance of roll drawing machines, but it should be considered that a heavy sliver has to be drawn so many inches, whether it is drawn on four machines or ten machines. The longer the draft, the weaker the yarn will be.

The worst evil on a card is letting a lap run out. Every overseer should brand this as a crime, because much damage is done by this carelessness, as it is liable to blister the cylinder, and puncture the screen. Sometimes, it will even raise the edge of the fillet in such a manner as to allow some of the points to find their way under the clothing, thus making a high place dipping into the flats or tops at every revolution of the cylinder. This trouble should be detected by the overseer or grinder, because a streak of one or more inches wide will appear on the flats, owing to the cotton clinging to the injured teeth of the flats.

Flats should travel from three to four inches a minute, in other words it should take 47 minutes to make one round. When calculating the draft of a card, the length of the staple being run should be taken into consideration. For one inch cotton, the draft of a card should not exceed 80; for medium stock 90; and long stock 100. The percentage of loss should also be considered. When drafting a card, first find the draft constant, then divide the draft constant by the draft gear, and multiply by .95, thus allowing five per cent. for waste.

There are two main change places on a card, namely (1) the change gear which controls the speed of the doffer as well as the feed roll; and (2) the feed gear which alters the thickness of the sliver delivered, or its weight per yard. A larger change gear increases the production of the card by turning out more length of sliver in a given time without altering its weight per yard. However, if overdone, the quality of the sliver produced is not quite so good. On the other hand, a smaller change gear causes less length of sliver to be delivered in the same time, but it is better carded.

A carder should always have the following objects in mind; (1) to produce as large a quantity as is consistent with the quality of the work required; (2) to consider the thousands of dollars of machinery intrusted in his care; (3) to avoid unnecessary waste; (4) to watch the use of supplies; and (5) to watch the waste of power. In summing up it should be remembered that work spoiled on a card can not be remedied in after processes. The basis for strong or weak yarn is laid in the carding.

Cotton forms one-fourth the value of the exports of the United States, and is therefore the greatest factor in maintaining the country's trade balance with the world. The American exports of raw cotton for the twelve months ended August 31, 1910, which covers the "cotton year," were 6,330,276 bales, valued at $460,093,295. This was 2,236,066 bales less than in the previous cotton year, but the value was $40,748,237 greater than the shipments for the twelve months ended August 31, 1909. In other words, the average export price this year was 14.2 cents per pound, against 9.4 cents last year.

NUMBER MAKING AND DRAFT ON SPINNING FRAMES.

BY J. T. I.

In this article I shall endeavor to tell of the art of making different numbers of yarn on a spinning frame, and shall assume that the reader is more or less familiar with the subject in a general way. Let us suppose that we have a frame with no roving in creel, and are told to make 20s yarn warp, and use 3.70 hank roving in the creel, running it double. The first thing to ascertain is what the draft constant of the machine is. In this case we have a 30 front roll gear, 120 crown, 84 back roll gear, 7/8 back roll diameter, and one inch front roll diameter.

$$\frac{1 \times 120 \times 84}{30 \times ? \times 7/8} = 384 \text{ constant for draft.}$$

In the bottom row of figures, the question mark represents the draft gear which is always left out in figuring draft constants. After obtaining the constant number we may proceed with the calculation:

(1) Rule—

$$\frac{\text{Draft constant}}{\text{Draft}} = \text{Draft gear.}$$

It is usual to allow about 5 per cent. for contraction in the yarn, due to twist.

3.70 hank doubled in the creel, equals 1.85 hank single. Allowing 5 per cent. contraction which is added weight, we shall consider the hank as 1.76.

(2) RULE: Yarn spun divided by the hank roving used equals the draft required on the machine.

$20 \div 1.76 = 11.36$ draft.

Then applying Rule No. 1:

$384 \div 11.36 = 33.8 = 34$ draft gear.

Thus a 34 draft gear will make 20s from 3.70 hank roving doubled in the creel. After running 15 or 20 minutes with this 34 gear on, take 8 bobbins and size them. If the frame is not making 20s, proceed like this: For example, suppose the yarn sized 19. Multiply the gear 34 by 19 = 646. 646 divided by 20 = 32.3 =32 gear.

The rule would read: Multiply the gear on the frame by the yarn number being made, and divide by the yarn number required. In explanation of this second change of draft gear, we do not in this instance know just how much the yarn contracts; it may be 5 per cent. sometimes and more in other instances. In the above example which sized 19 yarn, it did not contract 5 per cent., hence the smaller gear was required. Again, in common practice in the mill, the roving may run a little light or a little heavy, and this fact will sometimes make a difference in the calculated gear.

Suppose it is desired to change to a finer number of yarn using same hank in the creel. We were making 20s with a 34 gear say, and wish to make 24s.

Example: $34 \times 20 \div 24 =$ gear for 24s.

RULE: Multiply the gear on the frame by the number of yarn being made and divide by the number of yarn required. The result is the number of teeth in the new draft gear.

34×20 divided by $24 = 28$ gear.

AVOID TOO MUCH DRAFT. In changing to finer numbers with the same hank in creel, be governed by your draft. The draft making in 20s from 3.70 hank would be 10.8 or nearly 11, since 1.85 is contained 10.8 times in 20 (no allowance for contraction). But with the allowance for contraction we have 384 divided by 34 draft gear which gives 11.3, actual draft. Now if the theory figures 10.8 draft and the actual draft figures 11.36 yarn the percentage of contraction can be readily seen.

A draft of ten is generally considered enough. Some mills exceed this, and more run with less draft. Too much draft weakens the yarn, causes it to run badly, and it does not break up to standard on the yarn tester. Too much draft is a source of great evil and causes no end of trouble in the weave room.

CHANGING HANK IN THE CREEL. If the hank is changed in the creel at any time and it is desired to make the same numbers of any number within a reasonable range of drafts, we have the following:

RULE: Multiply the hank roving by 95; then multiply this by the draft constant. Divide this product by the number of yarn desired to be made. The result will be the number of teeth in the draft gear. Then size the yarn and proceed as explained before. In regard to the size of roving be sure that your roving sizes just what it is numbered, namely, 3.70 hank, or any hank used, or your calculations will be all wrong. You can not calculate on a roving being "such a number" when in reality it is something else. The roving must be of the right number, and by number we mean the right weight per yard.

PROVIDING FOR THE OPERATIVES.

BY C. M. B.

In small partially isolated villages or mill settlements, it is often customary for the mill management to subsidize the store, school, hall, doctor and other things that are necessary in the daily life of the operatives. The tenements should be near the mills and in healthy sections of the community. Four or five room houses are better than larger tenements, as they keep the family as a unit and do not allow room for boarders. There should be a boarding house for men and another for women, controlled by the mill management. The village should have a hall for the operatives' use either free or for a very nominal sum. When allowed the free use of the hall, the operatives feel that the mill management has an interest in their welfare and more than make returns in their work.

The company store is another important part of the mill settlement, and the company officials should see that all materials purchased are of good quality and sold as near cost as good management will allow. The settlement farm is another matter for careful consideration. The sale of milk, butter, eggs and vegetable products, under the management of a competent man, should result in a good investment for the mill and good values for the operatives. If the village is large enough, a settlement doctor is a valuable man. The mill officials should deduct a very small amount per capita per week from the operatives pay which goes to make up the doctors' salary. The more advantages that are given the operatives the better returns the mill will receive in satisfied help and cheerful workers.

NEW MACHINERY AND TRADE NOTES.

DEVICES FOR MOTOR PROTECTION.

In these days of electrically driven cotton mills, much interest is being taken in motor protection, not only as an operating cost reducer, but also to assist in fire prevention. The most universal method of motor protection is to install a circuit breaker, and in this connection the circuit breakers for motors will be considered in the order of the size of the motor which they control.

First is the type "ID" which is used for small motors up to and including 10 horsepower and 600 volts. These small motors are sold at a low cost and it is therefore necessary to provide a circuit breaker whose cost will not be excessive when compared with the motor. These small motors

FIG. 1. TYPE "I D" CIRCUIT BREAKER.

are used in textile mills where the air is full of dust and lint, and must therefore be entirely enclosed. They are usually handled by operatives whose knowledge of electrical matters is very limited, and must therefore be built to stand the dust and abuse and have no unnecessary parts to get out of order and cause trouble.

The "ID" fulfills all of these demands. Its cost is low, it is well protected and is operated either by means of a single coil, or by fuses which are contained in the same compartment as the circuit breaker. The current carrying mechanism consists of but a single spring of phosphor-bronze permanently fastened to the base at one end and free to move at the other. A simple crank toggle is provided which moves these springs in and out of engagement with the stationary base. A handle on the outside of the case has two stops, also on the outside of the case, the purpose of these stops being, to take the strain due to the opening and closing of the breaker and transmit it to the case itself and not to the operating mechanism of the breaker. It is also provided with an oil can in which the circuit is broken.

For larger motors from 10 horsepower to 100 horsepower at 600 volts the type "LS" circuit breaker is used which has laminated contacts of the brush type for carrying current; one or more trip coils as desired, for automatically opening the circuit breaker; and an arrangement by means of which the circuit breaker can not be held closed if the overload or short circuit should persist. The insulation of the "ID" and "LS" consists of a single piece of Monson slate and avoids the trouble caused by the breaking of bushings and consequent short circuiting of the device. It should be emphatically stated that to

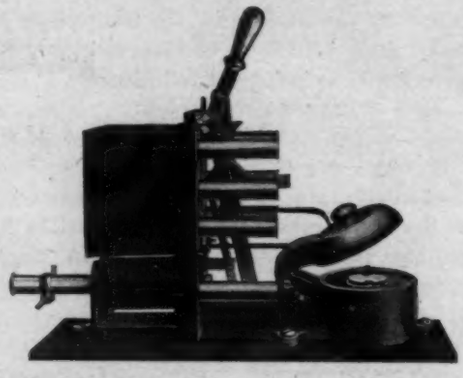


FIG. 2. TYPE "L S" CIRCUIT BREAKER.

obtain a proper protective device, be sure to give the manufacturer of these devices all the essential information relating to the machinery which is to be protected.

These circuit breakers are also manufactured in larger sizes to protect motors of large capacities and high voltages in types "E" and "D". Literature containing further information may be secured by addressing the manufacturers, the Condit Electrical Manufacturing Co., Boston, Mass.

THE WOONSOCKET MACHINE & PRESS CO., of Woonsocket, R. I., have awarded a contract for another large addition to their plant to the Eastern Construction Co., of Rhode Island. This new addition is the third large one which has been added to the manufacturing plant of this progressive company in the last ten years. This is a fitting testimonial to the high quality of the machinery which they turn out. The extra space will be devoted to increasing the output of their popular roving frame with its patented improvements, and also to the manufacturing of an entirely new drawing frame of the very latest design which is meeting with praise at every hand. This Company has also secured the right to manufacture the Boozer & Hill doffing machine for spinning frames and a large market is expected for this ingenious machine which was developed to its present stage at the Tucapan Mills, Tucapan, S. C. A speed of from 100 to 125 bobbins has been obtained by this machine.

The Cortright Metal Shingle Advocate is out for January and as usual it begins the new volume with a new and very attractive cover design. This little publication issued by the Cortright Metal Roofing Co., of Philadelphia, is devoted to roofing and roofing interests. It is sent free to any of our subscribers who are interested in these subjects and will take the trouble to drop them a line.